Railway Engineering and Maintenance

PROTECTION

At Lowest Cost

IMPROVED HIPOWER is non-flattenable and gives greatest shock absorbing protection to track joint parts at lowest cost.

THE NATIONAL LOCK WASHER CO.
Newark, N. J. U. S. A.

IMPROVED
HIPOWER
PARKERIZED

RAILWAY ENGINEERING AND MAINTENANCE
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Volume 23 December, 1927 Number 12

Railway Engineering and Maintenance

Formerly the Railway Maintenance Engineer

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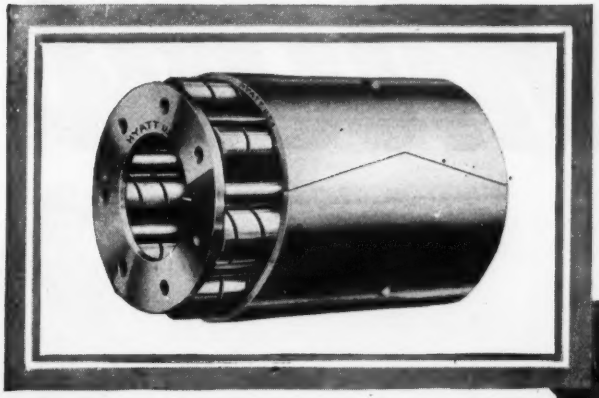
Hyattize your section cars for heavy duty



Hyattized cars or Hyattized replacement boxes are furnished by these leading manufacturers:

Buda
Sylvester
Northwestern
Fairbanks-Morse
Mudge
Fairmont
Kalamazoo

HYATTIZED cars can carry heavier loads, constantly and more efficiently. No coaxing. No track-side tinkering. They take your men to the job, and bring them back, quickly and dependably.

Year after year, under the most exacting conditions, Hyatts are giving continuous, economical service. Their helical rollers absorb the shocks of load and keep the lubricant circulating. New grease is required only three or four times a year. No other attention is necessary.

Don't wait until you need new cars to take advantage of Hyatt service. Leading maintenance car builders furnish replacement boxes to fit your present equipment. Write our nearest office for details.

HYATT ROLLER BEARING CO.

Newark Detroit Chicago Pittsburgh
Worcester Oakland Philadelphia Cleveland

HYATT

ROLLER BEARINGS

PRODUCT OF GENERAL MOTORS

The Fairmont

Performance on the Job Counts

Here is an improved track mower, made by Fairmont, which is faster—more efficient and more economical to operate than any now in use.

The most valuable new feature is the ability to cut any distance from the rail between two and thirteen feet by simply turning hand-wheels which move the power heads and cutter bars in or out. No tools are needed and there are no pitmans, extensions or equipment of any kind to change. In two minutes the cutter bars can be set for any sod line from twenty-four inches up, or extended to cut an outer swath ending thirteen feet from the rails on each side.

Another new feature is the ability to cut on the steep sides of high grades. The power heads are extended out over the shoulder of the grade and the cutter bars can incline downward from this point as much as desired.

Experienced mower operators will welcome the safe control. Each cutter bar is raised, lowered or tilted by one man who easily spins two hand-wheels. The cutter bars thus closely follow the varying shape of the grade as the mower moves along.

The sickles are driven by a separate engine which insures plenty of power to maintain the best speed in the heaviest cutting. The mower is towed easily by a good section motor car.

Quick Adjustable Mower

Use of a sickle engine results in faster progress and avoids the overloading which formerly wore out many motor cars used for towing mowers without an engine.

If the cutter bars strike a post no damage results as the mower is automatically uncoupled from the motor car, which reverses and couples up again by simply backing into the mower. Either sickle operator can step on the brake and stop the mower if the motor car driver fails to stop for obstructions.

Passing of whistle posts, semaphores, etc., is made easy by the power lift which quickly raises the cutter bars vertical and draws in the power heads if necessary. They can be quickly wheeled out again and cutting continued.

A turn-table of the screw jack type permits prompt removal from track at road crossings and set-offs, or cutting back over the same track with an outer swath. We are anxious to mail you a special bulletin which gives complete information about this improved Fairmont mower. Write for it now while the thought is in your mind.

FAIRMONT RAILWAY MOTORS, *Inc.*
FAIRMONT, MINNESOTA

DIFFERENTIAL

Double Fulcrum **AIR DUMP CARS** *Double Trunnion*

Patented

Up to the time that The Differential Steel Car Co. offered to the Railroads the Differential Double Fulcrum Air Dump Car, which gives combined low height, stability, down-folding door, and freedom from all locking mechanisms, there had been little improvement in dump car design for many years. Quick to sense the value of this car and its operating advantages, the Railroads received it enthusiastically.

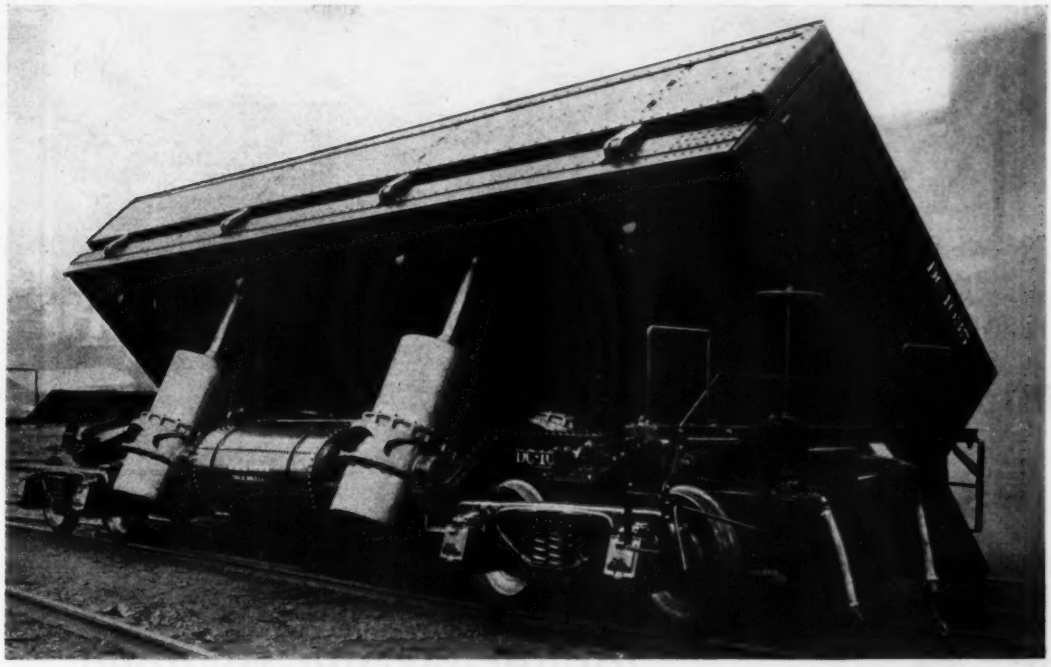
Almost as quickly, other dump car manufacturers sensed the superiority of this design. One by one, cars of the same general design began to appear with variations in construction, obviously for the purpose of avoiding patent infringement. Not only do these variations result in an inferior construction, but they also fail to avoid infringement.

The Differential Car, the original Double Fulcrum dump car, stands as a symbol of advancement. This same spirit of creative design and of original development insures you of the best design and construction when you purchase Differential Cars.

THE DIFFERENTIAL STEEL CAR CO.

FINDLAY, OHIO

THE DIFFERENTIAL STEEL CAR CO., FINDLAY, OHIO



SUPERIORITY IN CONSTRUCTION

Material—Steel throughout. All castings are steel. Dumping cylinders carefully made from best materials.

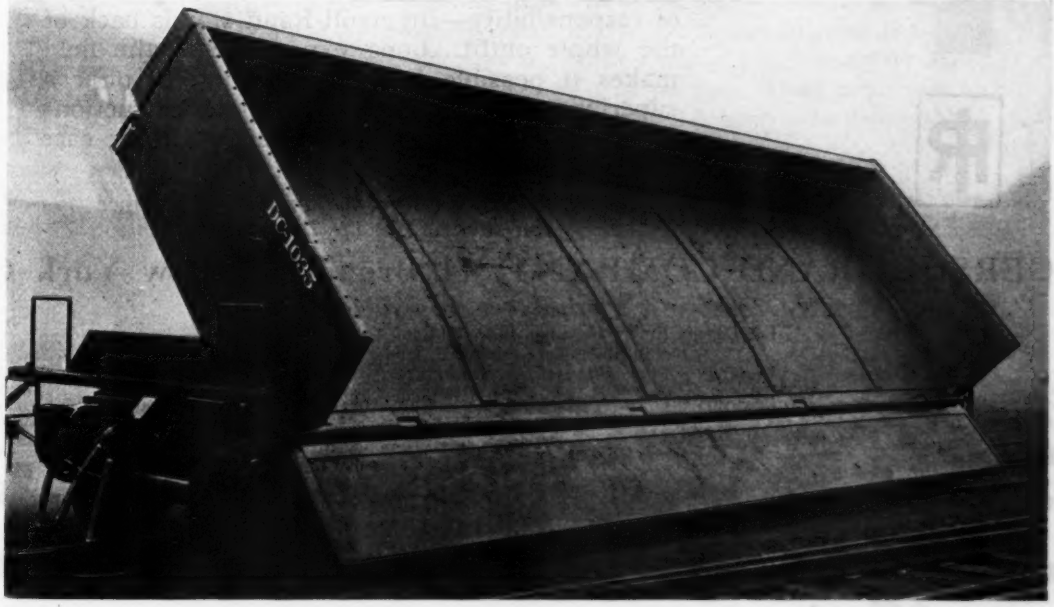
Door Construction—Down folding doors thoroughly reinforced. Rugged steel hinges at short intervals open and close the doors.

Simplicity—No complicated mechanism. Minimum number of working parts. Simplest door operating scheme.

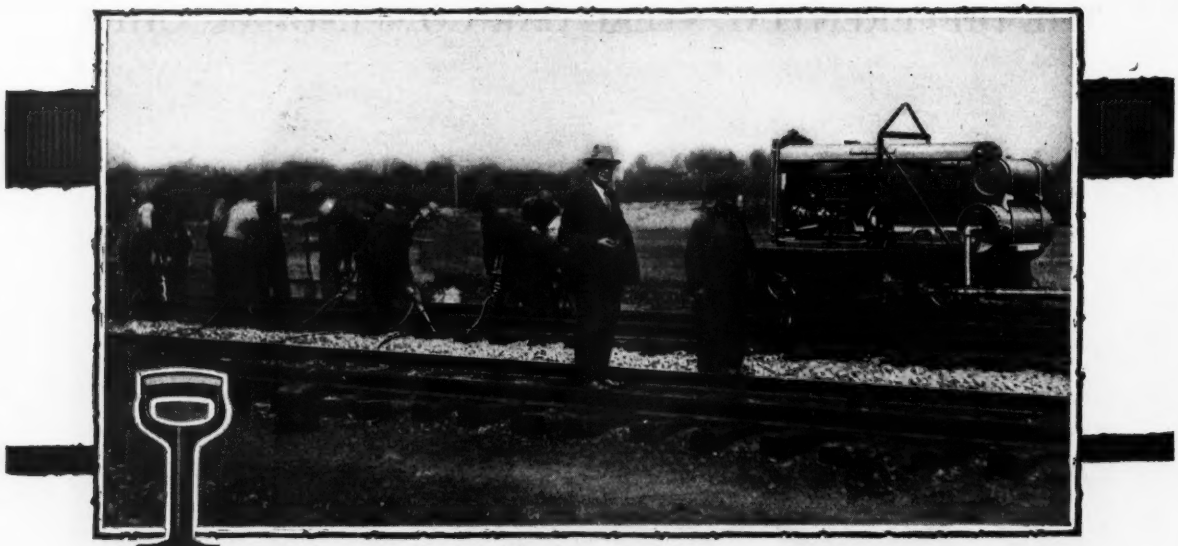
Floor Construction—Floor plate flanged down at side to form deep girders. Floor supported by lateral beams at short intervals.

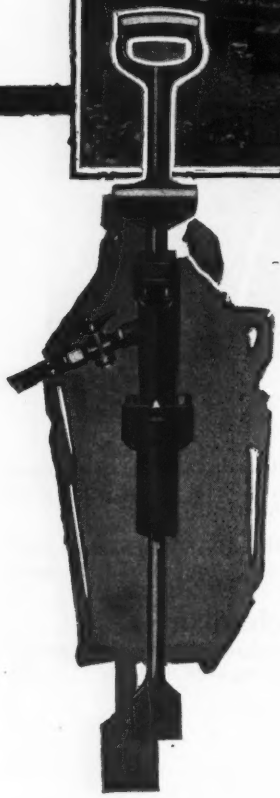
End Construction—Double plate end thoroughly reinforced. Extremely rugged and designed to resist deformation.

No Locking Mechanism—Car body rests on four points over bolster side bearings, allowing the elimination of the bug bear of dump cars, the locking mechanism.



(Patented)





Pneumatic Tamping makes a smoother and longer-lasting roadbed

Ingersoll-Rand Pneumatic Tie Tamping Outfits produce a more uniform quality of work and a safer and easier-riding track than hand tamping. Furthermore, their use results in important savings of both labor and money.

Ingersoll-Rand Company has developed complete pneumatic tamping units in three sizes—4-tool, 8-tool and 12-tool capacities. These units are the result of years of experience in building and servicing pneumatic tamping outfits.

With these complete units there is no division of responsibility—Ingersoll-Rand stands back of the whole outfit. Long experience in the field makes it possible for the Company to offer a superior service and to give complete instructions regarding the organization of gangs and the care and operation of units.

Ask for complete information and performance statistics on I-R Tie Tamper Units.

INGERSOLL-RAND COMPANY, 11 Broadway, New York City

Offices in principal cities the world over

For Canada Refer—Canadian Ingersoll-Rand Co., Limited,
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241-TT

Ingersoll-Rand

Not Made to Sell at a Price

But—to Render a Definite Service

THERE is a vast difference between the mere purchase of ties and really investing in a definite tie service. Cost per tie per year—not cost per tie—is the buying basis that spells true economy. Railroads today know that properly creosoted ties last at least 20 years at a cost of 15 cents per tie per year as against a life of 6 or 7 years for sub-standard ties at a cost of 25 cents per tie per year. There is not only a big saving in money but the service rendered is much more dependable.

2¢7
The International Dating Nail

You may pay a little more at the start for *International* Ties, but that little comes back many times over in savings due to longer life, fewer renewals, fewer track disturbances and lower maintenance cost.

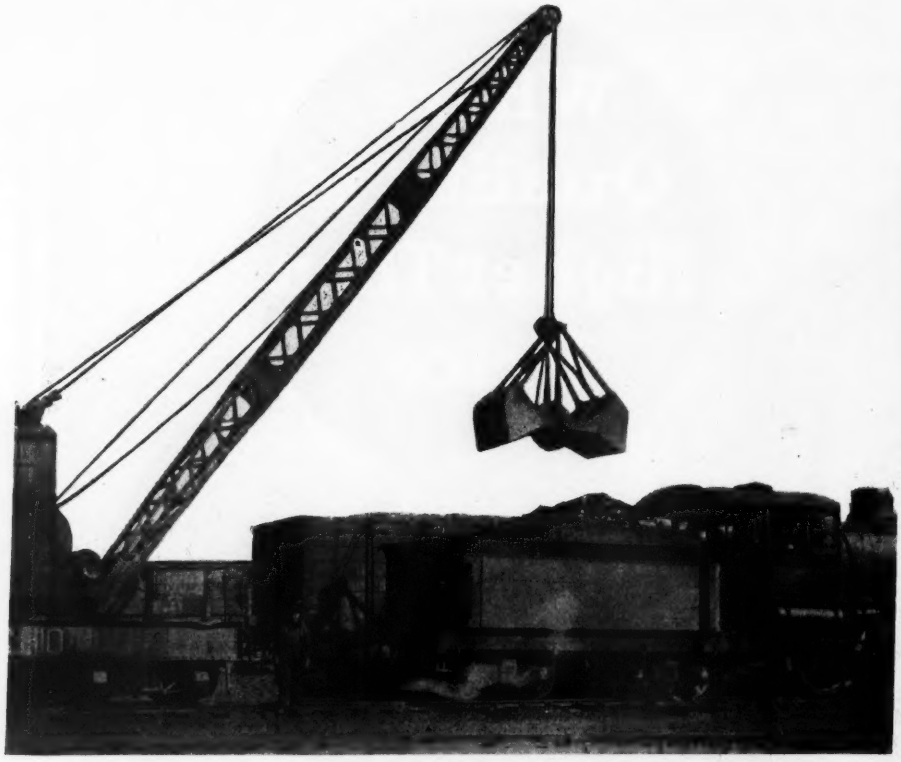
International Creosoting & Construction Co.

General Office—Galveston, Texas

International

- See -
Railway Engineering and Maintenance 1926 Cyclopedia Edition for detailed information

STANDARD SPECIFICATION TIES



Put the coaling of engines on a definite schedule

The maintenance of freight and passenger schedules demands "schedules backed by schedules"—the systematic planning of preparatory work in the yard.

Such work, for example, as the coaling of locomotives. And here Hayward Buckets can play an important part by maintaining the same high output of work day after day, year in and year out.

Hayward Buckets dig big loads, and open and close easily and rapidly. And the coaling of locomotives with a Hayward is a one-man proposition.

There are dozens of other uses to which railroad men are putting Haywards; ask our engineers to tell you about them.

THE HAYWARD COMPANY
46 Dey Street New York, N. Y.

Builders of Clam Shell, Drag Line, Orange Peel and Electric Motor Buckets; Dredging, Excavating, and Coal Handling Machinery, Automatic Take-Up Reels; Counterweight Drums.

3657-J

Hayward Buckets

AMERICAN
AURORA, ILL.

Deep Well Turbines

THE AMERICAN WELL WORKS

General Offices AURORA, ILLINOIS *and Factory*

NEW YORK, N. Y. ROOM 523 . . . 165 BROADWAY
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VANCOUVER, B. C.
CANADA

AMERICAN

AURORA, ILL.

PICTURED on the opposite page is an "American Hollow Shaft Motor Deep Well Turbine Head. This is the "driving end" of the "American" deep well turbine, and is designed for use with hollow shaft motors. In this type of head the turbine line shaft extends up through the motor with a driving connection at the top. The pump's thrust load is carried by the top motor bearing, which is designed to carry this extra load. All adjustments are made at the top of the motor.

Due to its design, this Turbine Head has the great rigidity necessary to counteract any vibration from the moving parts in the line shaft and pump end of the turbine. The discharge is below the floor, as in other types of "American" Deep Well Turbine Heads.

Illustrated on this page is the "pump end" of the "American" large capacity non-diffuser turbine. This type of turbine permits an unusually large capacity with relation to the size of the well, and is suitable for use in bored wells from twelve inches and larger inside diameter.

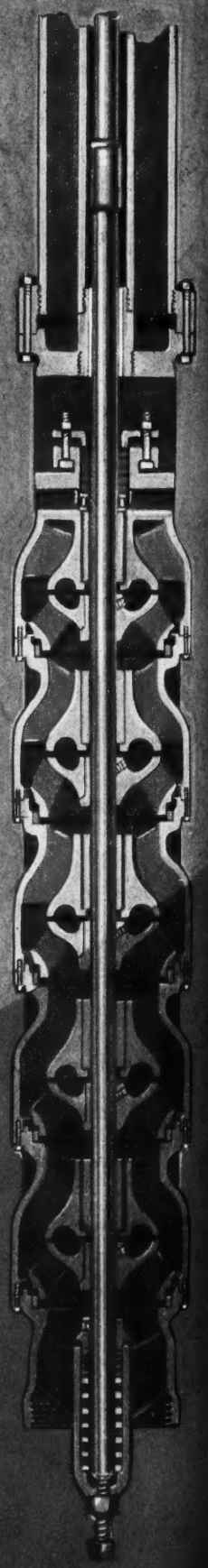
The turbine proper is a special type of vertical centrifugal pump and consists of one or more stages. Impellers are made of bronze and are carefully designed with blades accurately hand finished. They are in perfect rotative balance when mounted, with all moving parts on the shaft. Removable wearing rings are provided.

The turbine proper has two main bearings. The top bearing is separated from the water in the pump by a packing box and a leakage passage, which effectually prevents leakage from reaching the upper bearings. The design of this bearing prevents the entrance of any sand or gravel. The bottom or "tail bearing" is a patented feature of "American" Deep Well Turbines. Its design is of particular merit, as it dispenses entirely with lubrication by means of an oil line from the surface. This obviates the constant trouble of oil leaking into the turbine through oil pipe lines.

Special engineering bulletin on all types of "American" Deep Well Turbines is available. A copy will be forwarded to you on request.

THE AMERICAN WELL WORKS

AURORA **ILLINOIS**

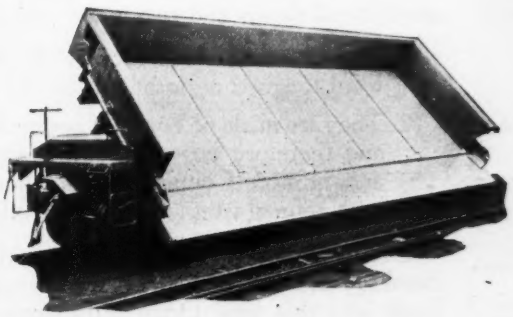


A seven-car train of Western Drop Door Dump Cars on 35-foot trestle. The actual time of dumping the entire train of cars after air was cut into the operating line at the locomotive was five seconds. It only required 25 seconds for a train of cars to dump the load, right the cars and be on its way back to the shovel.

IT'S THE LAST WORD

The new Western Drop Door Dump Car is all of that. It is the culmination of years of study and experiment in the field. An air dump car of low loading height, single stroke cylinders, and no locks — especially designed to meet the problems of railroad maintenance-of-way.

In operation, the steep dumping angle of 50 degrees, insures speedy and clean discharge of the load. The dumped material is deposited far enough from the track to establish immediate train clearance for following trains, without spreading or hand shoveling.



The drop door extends four feet eight inches out from the rail in dumped position, giving complete protection to the ballast. The low-loading height permits the ditcher to dig farther below the rail.

Bulletin No. 27-QRE gives complete details. Write for a copy today.

Western

WESTERN WHEELED SCRAPER COMPANY

Pioneer Builders of Air Dump Cars

AURORA ILLINOIS

Toncan Iron Culverts and Sub-Drains will keep your roadbed free from water.

Sub-Drains Of Toncan Iron Last Longer and Work Better

TONCAN COPPER Mo-lyb-den-um IRON

Following are the makers of Toncan Culverts. Write the nearest one:

The Berger Mfg. Co., of Mass. Boston, Mass.
The Berger Manufacturing Co. Dallas, Texas
The Berger Manufacturing Co. Jacksonville, Florida
The Berger Manufacturing Co. Minneapolis, Minn.
The Berger Manufacturing Co. Philadelphia, Pa.
The Berger Manufacturing Co. Roanoke, Virginia
The Canton Culvert & Silo Co. Canton, Ohio
The Firman L. Carswell Mfg. Co. Kansas City, Kan.
The Pedlar People Limited, Oshawa, Ontario, Canada
Tri-State Culvert Mfg. Co. Memphis, Tenn.
The Wheat Culvert Co., Inc. Newport, Ky.

SUB-SURFACE water is a great roadbed disturber. It causes misalignment and uneven track. Remove it and you remove one cause of track maintenance.

Yards, cuts, sags and similar collectors of water all need sub-drainage for the protection of the roadbed.

Toncan Iron Drains have all the advantages of corrugated metal drains and two more:

1. They retard the entrance of dirt by the use of outward tongued perforations instead of usual holes.
2. They are made of Toncan Copper-Molybdenum Iron and therefore possess higher resistance to corrosion and erosion. Copper and molybdenum are alloyed with refined iron to give longer life.

Drains of Toncan Iron give better drainage, eliminate breakage and reduce maintenance for many years to come. Look into this vital Drain improvement made only in Toncan Iron.

CENTRAL ALLOY STEEL CORPORATION, *Massillon*, OHIO
World's Largest and Most Highly Specialized Alloy Steel Producers
Makers of Agathon Alloy Steels

Cleveland Detroit Chicago New York St. Louis
Syracuse Philadelphia Los Angeles Tulsa
Cincinnati San Francisco Seattle

TONCAN COPPER MO-LYB-DEN-UM IRON

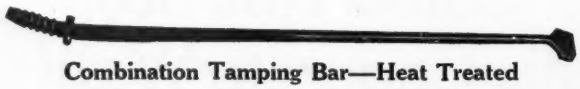
SAVING LABOR AND TOOL COSTS

Hackmann Combination Track Liner

THE HACKMANN Combination Track Liners can be found in use on *over 100* of the leading roads of the country, and are producing results far above expectations. For lining tracks, frogs and switches, raising low joints and spacing ties they cannot be duplicated.

Try them on your tough jobs and see with what ease they will smooth rough track without disturbing the roadbed. They can be operated with unequalled success against the end of switch ties. The Hackmann Combination Track Liners weigh but 20 pounds. They are made of steel and are small and easy to handle. Greatest efficiency is obtained when they are operated with the special bars shown below.

Combination Lining Bar—Heat Treated



Combination Tamping Bar—Heat Treated

Showing sharp curve with guard rail in stone ballast being lined by seven men with Hackmann Track Liners from 3 to 4 inches. It was impossible for 20 men to do this work with lining bars without digging.

Hackmann Duplex Track Liner

Hackmann Duplex Track Liners are operated with ordinary lining bar. Removable Fulcrum.

Note the Two Step Feature at top of base. You can make at least two pulls without resetting the liner. They can be left in track, allowing trains to pass over without any danger.

WRITE FOR ILLUSTRATED
AND DESCRIPTIVE LITERATURE

THE HACKMANN RAILWAY SUPPLY CO.

J. J. FRANZEN, *Secretary and Treasurer*

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WM. ZEIGLER & Co. 425 S. Fifth St., Minneapolis, Minn.
THE HOLDEN CO., Ltd., Canada Montreal, Toronto, Winnipeg, Vancouver
BUFF & BUFF MFG. CO., New York
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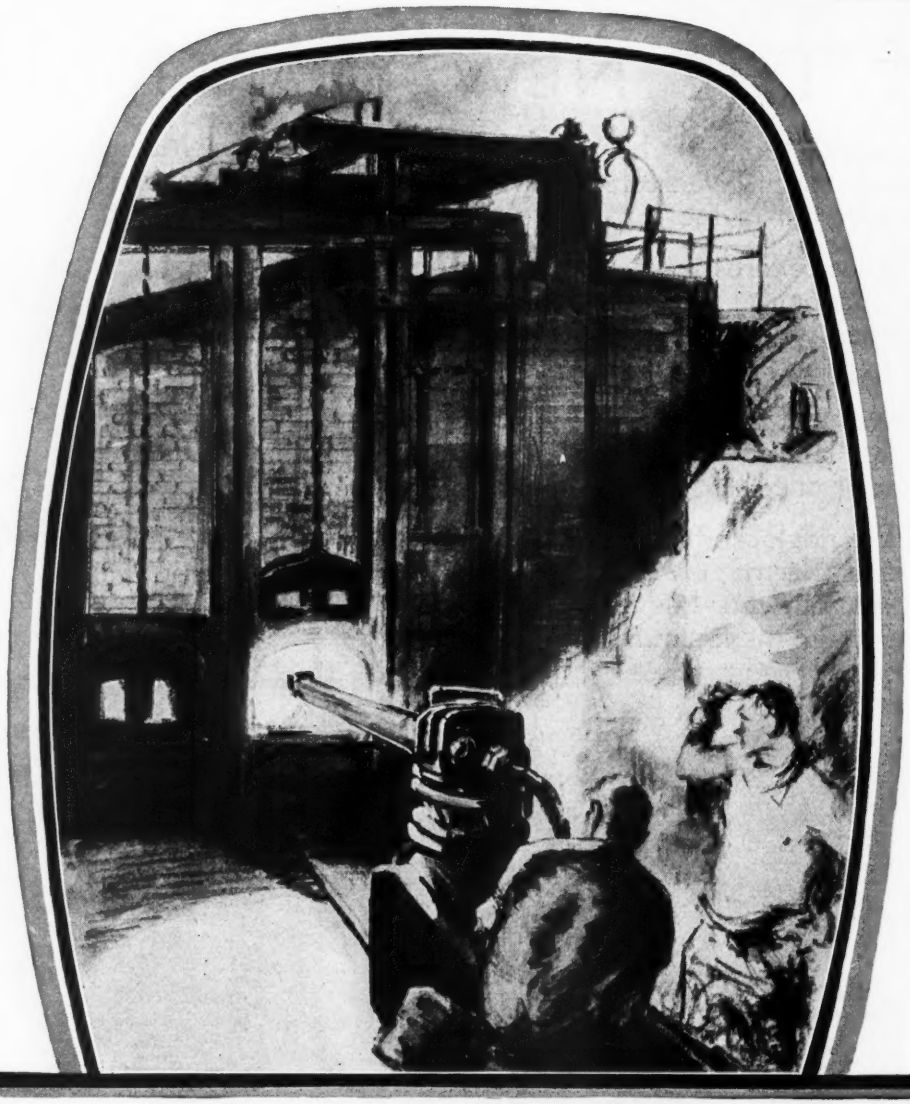
ADDRESS ALL COMMUNICATIONS TO THE COMPANY



A New Mill

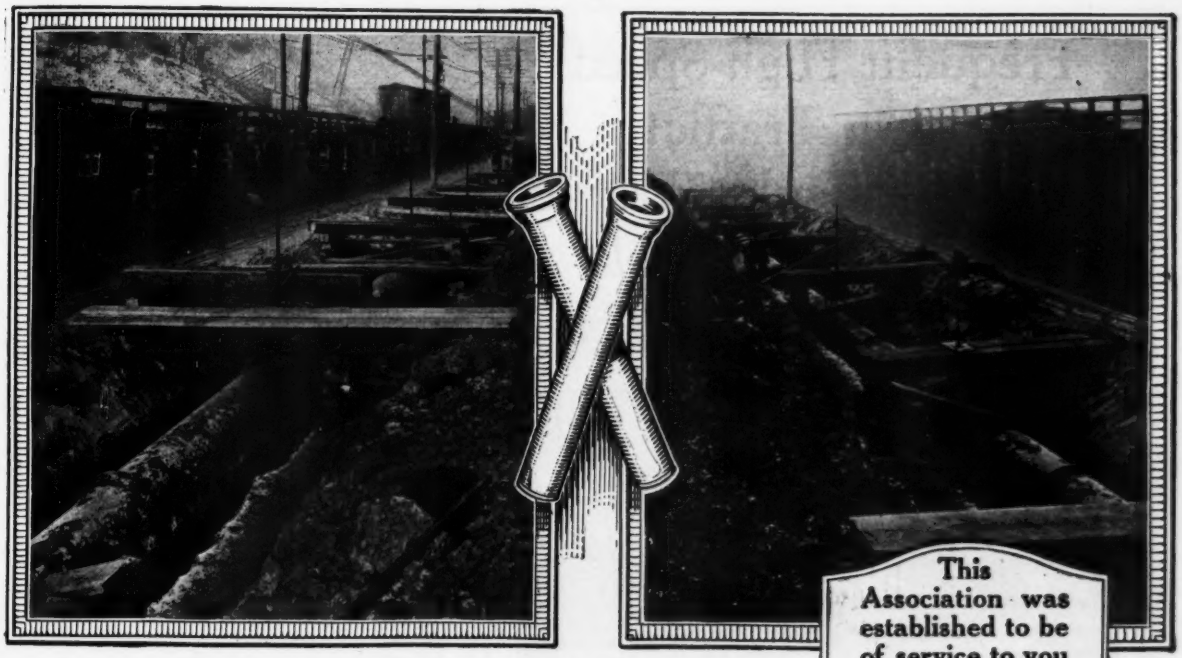
fitted with every known facility for meeting exacting specifications

To steel-making experience extending over decades, the Illinois Steel Company now adds a mill embodying the most advanced features yet devised for close-gauge rolling of alloy steel. • • Every item of equipment from furnace to pickling vat is of latest design. Every responsible position in the mill is filled by an alloy steel specialist. • • The result is alloy steel that not only meets your specifications but is of such physical quality that material savings are frequently effected in the purchaser's production costs. • • You owe it to yourself to place this dependable source of supply on your list.

Illinois Steel Company

Chicago

ILLINOIS *Alloy* STEEL



Its flexibility is an established fact

This Cast Iron Pipe Installation in Pittsburgh is being raised bodily to a new level of a re-graded street, without interfering with heavy traffic in the slightest.

THE strength and flexibility of Cast Iron Pipe lines with the Bell and Spigot Joint enable engineers to raise or lower such lines without interrupting the service in any way.

This is of the greatest importance especially where an interruption to the water or gas service in industrial areas would result in a serious economic loss.

For permanence and low maintenance cost and adaptability to industrial needs Cast Iron Pipe has no equal.

CAST IRON PIPE RESEARCH ASSOCIATION
People's Gas Building, Chicago, Ill.

This Association was established to be of service to you

Information regarding the various accepted methods of handling alterations and moving of gas or water mains will be gladly forwarded to you.

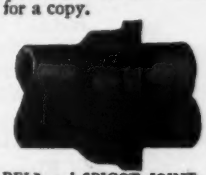
Its functions are:

1. Collecting and compiling data with reference to Cast Iron Pipe and fittings for all purposes.
2. Assisting engineers in solving difficult and unusual problems.
3. Educating the public by national advertising in the importance of having up-to-date waterworks.

—It has nothing to sell.

Engineers, municipal authorities and contractors are invited to write for special literature on the subject of water systems.

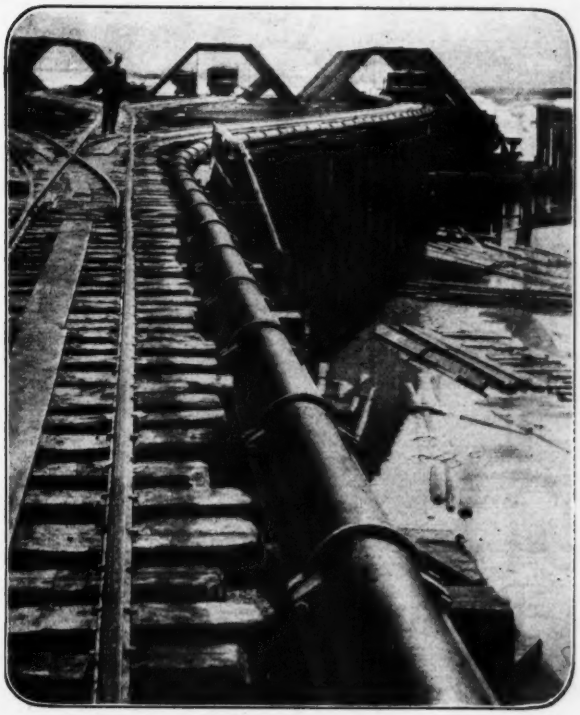
Of especial importance is a reprint of an article on the "two mains system." Send for a copy.



BELL *and* SPIGOT JOINT—*the accepted standard for underground construction.*

CAST IRON PIPE

— In continuous service for over 250 years



A Partial List of Railroads using Universal Pipe

FLORIDA EAST COAST
NEW YORK, NEW HAVEN & HARTFORD
CHICAGO AND NORTHWESTERN
CHICAGO, BURLINGTON AND QUINCY
LONG ISLAND
LOUISVILLE & NASHVILLE
DELAWARE, LACKAWANNA & WESTERN
MOBILE & OHIO
CANADIAN PACIFIC RAILWAY
PENNSYLVANIA LINES
BOSTON & ALBANY
BOSTON & MAINE
CENTRAL VERMONT
WHEELING & LAKE ERIE
INTERNATIONAL RAILWAYS OF CENTRAL AMERICA
TRUXILLO R. R. OF HONDURAS
TELA R. R. OF HONDURAS

Easier Quicker Safer

Savings all along the line

Wrenches the only tools!

THE ONLY cast iron pipe that eliminates all jointing materials and equipment. Universal Pipe does away with pouring, calking, lead, lead substitutes, melting pots, ladles, furnaces, fuel and the rest of the paraphernalia required in making the ordinary pipe joint.

There is nothing to deteriorate, nothing to work loose in the Universal Pipe joint. The hub and spigot ends, machined at slightly different tapers, are drawn into direct contact, forming a flexible joint that amply provides for expansion and contraction, vibration and uneven ground settlement. Curves laid with standard 6-foot lengths.

Wrenches the only tools. Experienced labor unnecessary. Installed practically anywhere, in any season. Thousands of miles laid every year.

Put your water supply and other pipe problems up to our nearest office: New York, Graybar Building, Lexington Avenue at 43rd Street (adjoining Grand Central Terminal) . . . Chicago, McCormick Building . . . Birmingham, Comer Building . . . Dallas, Praetorian Building . . . San Francisco, Rialto Building.

UNIVERSAL CAST IRON PIPE

No bell holes to dig: No joints to calk

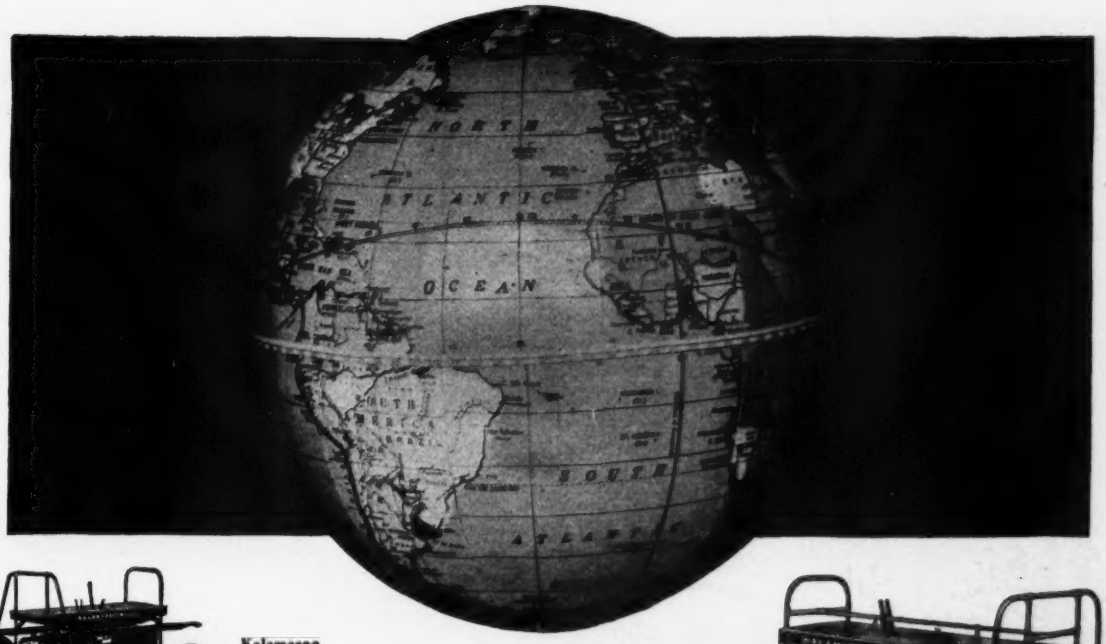
THE CENTRAL FOUNDRY COMPANY

Subsidiary of The Universal Pipe and Radiator Company

Graybar Building, 420 Lexington Avenue

Chicago Birmingham New York Dallas San Francisco

B-8



Kalamazoo "16L" Seating Capacity 2 Men

It's Hard to Find a Country on the Globe Where "KALAMAZOOS" are not on duty

From Afghanistan to Zanzibar—wherever there's a railroad—there are Kalamazoo Motor Cars whisking men to their maintenance, construction or inspection work.

There's a Kalamazoo for every need and purpose

KALAMAZOO RAILWAY SUPPLY CO.

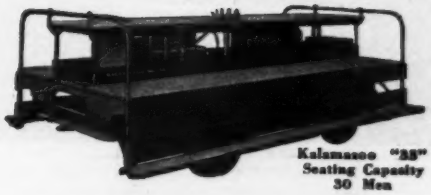
Established 1884

Kalamazoo **Michigan**

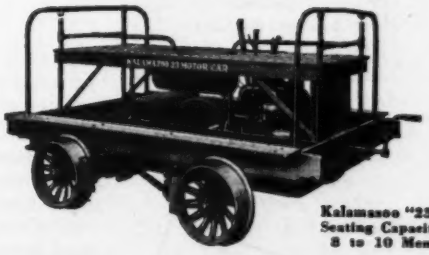
New York	New Orleans	Portland, Ore.	Johannesburg
Chicago	Denver	Havana	Vancouver
St. Louis	Spokane	London	Winnipeg
St. Paul	Seattle	Mexico City	Montreal

Kalamazoo Means Service to You.

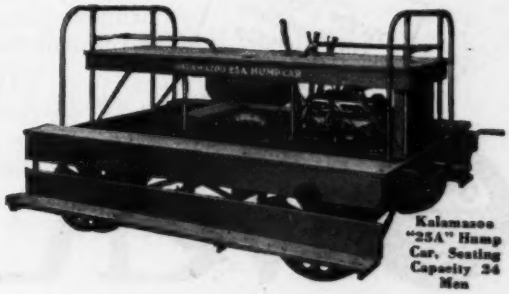
Kalamazoo "17" Seating Capacity 6 to 8 Men



Kalamazoo "28" Seating Capacity 30 Men



Kalamazoo "23" Seating Capacity 8 to 10 Men



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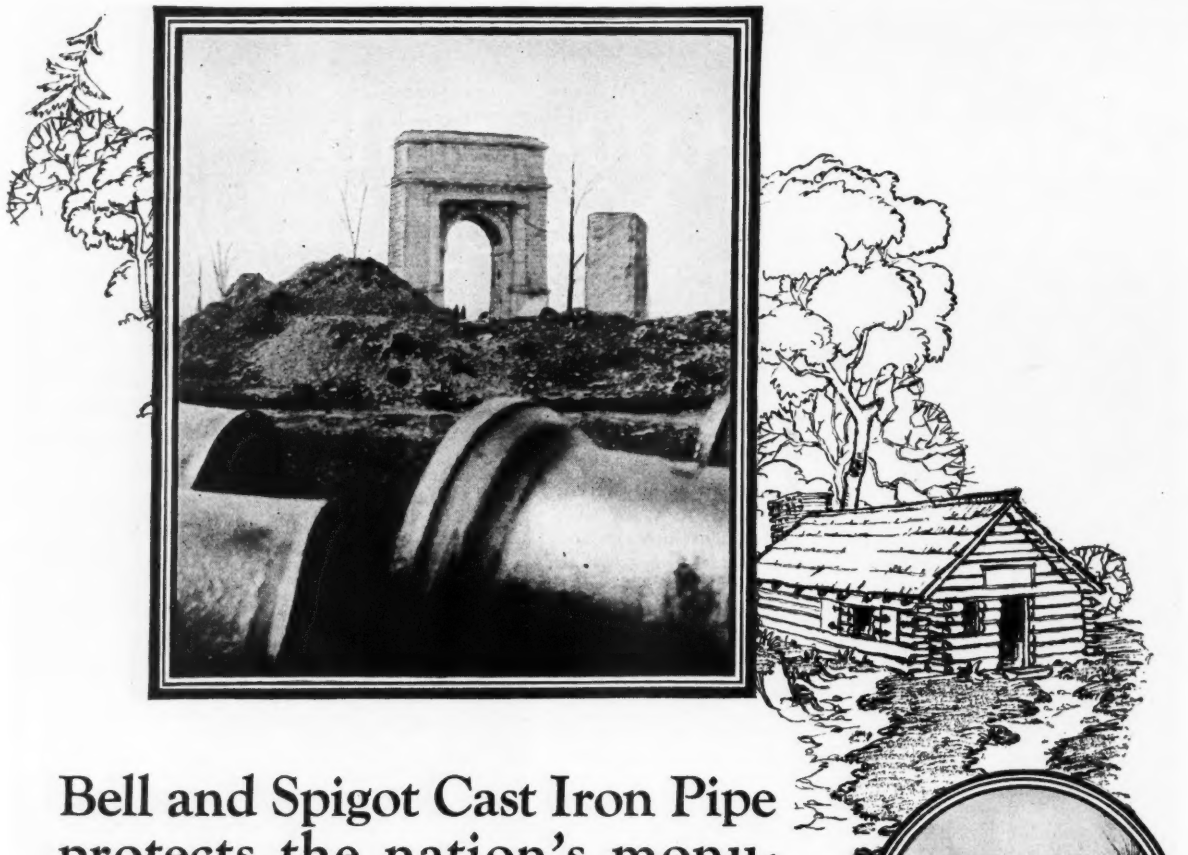

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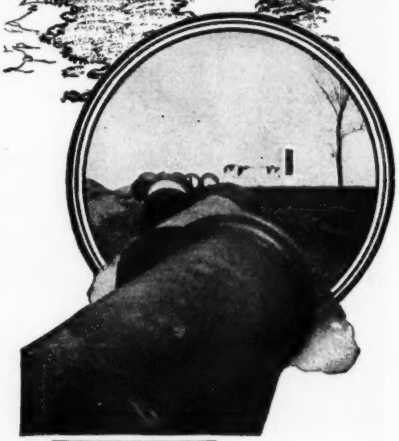

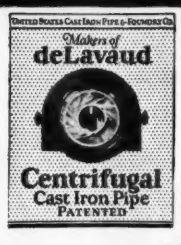

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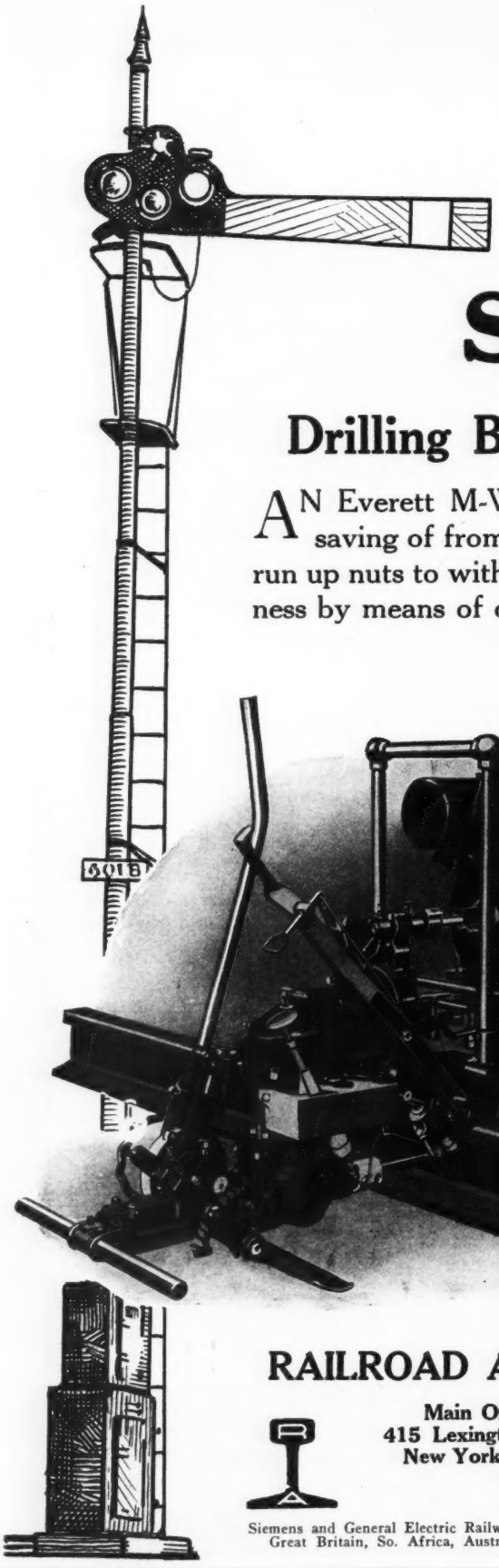

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Railway
Engineering and Maintenance

Volume 23 December, 1927 Number 12

MAKE A NOTE OF IT

WINTER is now on us. The period of greatest stress for the track and roadbed is at hand. It is now too late to remedy any deficiencies that may exist on the more northerly roads, at least. New defects will also become apparent as frost enters the roadbed and as the wear and tear of the winter's traffic exacts its toll. It is important that full records be made during the ensuing weeks of cold weather of these deficiencies as they develop in order that they may not be lost sight of when spring comes.

Track maintenance is a never-ending contest with climate and traffic. The constantly increasing weight of locomotives and of trains brings new weaknesses in the track and roadbed to light. It is the problem of maintenance forces to correct these conditions as they become evident and to forestall them wherever possible. In the summer many of these shortcomings can be corrected as they appear. In the winter, however, this is frequently impossible owing to the inadvisability of disturbing the roadbed when frozen. It is of such defects that proper notes should be taken in order that the deficiencies may be corrected in the spring and a repetition of the trouble avoided.

ADEQUATE CLERICAL ASSISTANCE

IF THERE is any one point on which roadmasters and bridge and building supervisors are agreed, it is that they have insufficient clerical assistance. To some extent this attitude may be a reflection of the normal desire of every ambitious, alert man to enlarge his organization and to take on more work. The constant reiteration of this comment, however, indicates that the cause is more deep-seated than this and that it is an evidence of a real need. It is a reflection in part of the growing demand for reports and "explanations." It is even more an indication of the increasing realization on the part of supervisory officers of the part that records play in the economical conduct of their work today.

A supervisor is essentially a field man. His forces are all outside and widely scattered. He can be most effective when in close touch with the work that they are doing. This contact he cannot maintain if he is required to spend a considerable part of his time in the office, or to devote his evenings after he comes in from a hard day on the road, to handling routine matters. The magnitude of the expenditures made under his direction are sufficiently large and the possibilities for loss sufficiently great to warrant the furnishing of adequate clerical assistance to reduce the demands on the time of these supervisory officers for routine work to the minimum. Furthermore, the railways as a whole have not as yet realized the extent to which the economy of maintenance work can be promoted by the closer supervision of the cost records of different gangs by local supervisory offices familiar with the conditions. It is in the compilation of such data that an efficient clerk can be of the greatest assistance to the supervisor.

A BIG PROGRAM

IN THE last issue we called attention to the fact that the records of the Interstate Commerce Commission showed that the railways spent more for *maintenance* of their roadway and structures during the first eight months of 1927 than in any previous year. Within the last month the Bureau of Railway Economics has collected from the roads and made public data regarding the expenditures for *improvements* during the first nine months of the current year which show that the railways have likewise spent $7,153,000 or 2 per cent more for roadway improvements this year than ever before. These figures substantiate what every maintenance man has realized about the season's activity. In one respect, however, the figures fail to give a fair comparison with past years. This is due to the fact that a dollar has bought more in materials and in labor output this year than in the recent past. As a result, the season's activity, measured in the amount of work done, has been even greater than the comparison of expenditures indicates.

TWO EMERGENCIES MET SUCCESSFULLY

SINCE the last issue a large part of New England has been visited by a terrific flood which inflicted serious damage on railway property and demoralized transportation over a wide area. While of smaller scope, it was more serious in many ways than the flood in the lower Mississippi river valley last spring. These two disasters in such widely separated areas will cause 1927 to be long remembered as a year of unusual floods and of unusual demands on maintenance men.

No condition creates a more acute emergency for maintenance of way forces than a flood. Railways are helpless before them. In floods such as that in New England, there is no time for preparation. The interruption of traffic that ensues makes it imperative that lines be restored to service at as early a date as possible, even at personal hazard to employes. The records of this year's floods are replete with stories of hardship and of reconstruction operations under almost unbelievable handicaps. Yet it is to the credit of the railways and particularly of their maintenance of way forces that traffic was handled without mishap or loss of life among passengers and

with almost complete absence of fatalities among employees themselves. Emergencies such as these call for the best in men—they also show the inherent strength and loyalty of the maintenance organization on the average railway today.

AN UNUSUAL WATER SUPPLY PROBLEM

THE STORY of the development of the boiler water supply on the Western lines of the Canadian National, which is related on page 516, is unusual in numerous respects, not the least of which was the opportunity offered for the provision of stations with little or no regard to existing facilities on a group of railway lines sufficiently large to form a system in themselves. As stated in the article, the lines of this system in western Canada are all of recent construction. They were built for the most part as cheaply as possible to permit their promoters to construct as many miles as possible with the money available. In keeping with this policy the early water stations were of the simplest form and little consideration was given to the economics of the supply.

Following the consolidation of these several lines into the Canadian National system and the improvement of their credit, following the war, opportunity was afforded for the rehabilitation of these facilities over a wide area. This was an opportunity that comes to few roads. It permitted this problem to be approached from the standpoint of a system as a whole, rather than from that of an isolated station. That it has been attacked in a thorough-going manner is shown by the fact that reservoirs have already been constructed at 25 points with a combined capacity of nearly 2,000,000,000 Imperial gallons. Incidentally, there is much to be learned from the experience of this road in the selection of reservoir sites and in the building of earth dams and spillways.

THE STORY OF BRIDGE BUILDING

ON PAGES 520 and 521 of this issue we reproduce some photographs of bridge models displayed at the Baltimore & Ohio Centenary Exhibiton showing in chronological order the advance in the art of bridge design. Two types, the plate girder and the Howe truss, have been subject to little change during the course of their many years of application, other than a refinement of details. It is in metal truss forms that we find a far greater range of development, the most noteworthy feature of which is a gradual simplification of outline. The primary reason for this lies in the fact that the early bridge engineers were compelled to carry out their designs with a limited knowledge of the mathematics of structural frames, although they accomplished remarkable results with means at their disposal.

What is more remarkable is the high grade of workmanship which these pioneers were able to secure with the mechanical equipment available in their day. The panel point connections were often crude and cumbersome, but the joining of the members was usually such as to produce a tight fit.

Bridge building in the early days was more of an art than an applied science. There were neither text books on design nor detailed specifications for designing structures, covering the minute details and representing the results of mathematical studies, laboratory tests and practical experience. As a consequence the design of bridges as well as their fabrication and erection in those pioneer days were necessarily the work of men who seemed to have developed an intuitive sense of structures and their proportioning, and they did their work well.

Less favorable comment can be made concerning the period which followed this formative stage of bridge building. As a result of the application of mathematical analyses, still none too well developed, bridges were built in which the main members were of adequate proportions but with poorly designed details and connections. It is the spans of this period that still remain in service which are giving trouble for the maintenance man today. When these are eventually replaced by modern structures the problems of bridge maintenance will be greatly simplified.

MAKING EVERY DAY COUNT

IN AT least one respect winter offers a better indication of the executive ability of a maintenance foreman than summer. This is due in part to the fact that the weather is more adverse and the storms more difficult to cope with. It is due even more, however, to the fact that on many roads it is still the practice to reduce the gangs to skeleton organizations and thereby make it difficult to do much work efficiently than can be done without difficulty with a normal force.

With a small gang it is easy and perhaps natural for a foreman to take the position that he can do no constructive work with the few men that he has and, therefore, to content himself with "puttering around," with the result that the time of his force is largely wasted. The resourceful foreman, on the other hand, will strive to devise ways to overcome the handicap of a small force and to do *some* constructive work each day. He may not do it as efficiently with his small force as he could with a summer gang, but he will at least get something done every day and in the course of a month will complete a very appreciable amount of work and get it behind him for the season. That foreman shows the greatest ability who is able to make progress under handicaps and who accepts the necessity for a force reduction as a challenge to his initiative rather than as an excuse for "slacking off."

DON'T GET DISCOURAGED

WHEN a certain trunk line railway recently purchased a short line it was realized that the tracks and structures were in a greatly depreciated condition but it was not until the new officers assumed control that they learned the true extent of the mismanagement, or lack of management from which it had suffered. Conversation with the old officers disclosed a surprising ignorance on their part of the actual conditions of the property, while questions put to section foremen revealed the fact that the roadmaster had visited the more remote parts of the line only infrequently.

In the face of inadequate earnings and little prospect of any improvement in the financial condition of the property the old management had had ample reason to be discouraged and had no doubt assumed an attitude expressed by the words "what's the use?" Obviously the roadmaster would have received little support if he had tried conscientiously to keep the road in the best condition possible with the limited appropriation placed at his disposal. But regardless

of the lack of encouragement from his superior officers it was his personal responsibility to keep the track safe for the few trains that were operated, insofar as it was humanly possible, so long as he retained the position of roadmaster. The fact that there were no serious accidents was merely his good fortune.

There have been times in the experience of nearly every maintenance officer when decisions of the managment have run counter to his recommendations and he has suffered keen disappointment because his plans for carrying out his work have been seriously disturbed by curtailed appropriations. However, a railroad officer's training makes him a good soldier and he carries on in spite of these setbacks, realizing that the management is confronted with grave problems which he may not fully understand. Moreover, he feels a personal responsibility for the safety of passengers and train crews and never relaxes his vigilance regardless of circumstances which cause him keen disappointments. Young men, when their spirits are low, will do well to take counsel with their older associates, for with the improved financial and physical condition of most railroad properties the problems of maintenance today are as nothing when compared with the difficulties of limited appropriations and labor and material shortages that beset the maintenance man in years gone by.

IT IS BEING DONE

ONE OF the outstanding developments in railway construction and maintenance work in the last few years has been the steadily increasing amount of work that is being done each winter. Not many years ago it was the almost universal practice at this season to reduce forces to a "winter basis," which was merely another way of saying that they were cut to the minimum consistent with protection against emergencies. With the increasing use of machinery and equipment more highly skilled men have become necessary and it has been the experience that these men, when laid off in the fall, seldom return the following spring, making necessary the training of other crews. To overcome this trend, railway men on not a few roads have set out to find whether it is not possible to rearrange their schedules so as to provide continuous constructive employment for their men throughout the year. As a result a number of roads have so rearranged their working programs as to provide for the transfer of much of their work into the winter.

Much attention has been directed to this trend in track work. While less has been said about its application to bridge and building work, the progress has been equally rapid as was shown by the discussion of this subject at the Minneapolis convention of the Bridge and Building Association. When it is possible for a road like the Canadian Pacific to reconstruct a hotel of reinforced concrete construction in the Canadian northwest in the winter, as was done last year; when roads located as far north as the Delaware & Hudson report that they have not laid off a man in four years; and when other roads like the Central Vermont state that they find more work for their gangs to do than can be completed during the winter, it is evident that the year-round employment of men is not as impractical as would appear at first glance, or as some railway officers still contend. The progress that has already been made in this direction indicates that we are rapidly approaching the day when maintenance forces will be organized upon a permanent basis with employment throughout the 12 months and with a great resulting reduction in turnover. At this season of the year when many roads are planning to reduce their forces, consideration may well be given to the possibility of setting forward some of the work now scheduled for completion next summer, and thereby justifying the retention of some of the experienced men now slated to be laid off.

PASSENGER STATION MAINTENANCE

MORE THAN 50 business men and citizens recently sent telegrams to the management of a railroad that was building a line through their town, a place of less than 1,000 inhabitants, protesting against what they considered the inadequate size of the passenger station to be built at that point. While passenger business originating at small towns has probably decreased in greater proportion than that from any other source, the size, design and general appearance of the railway station continue to serve as an object of attack when a town of 1,000 has a "10,000" booster club. The first step is to get the railroad to provide the "10,000" passenger station. This is especially important if a rival town already has a better station.

But once the new station is placed in service, a thoughtless public soon forgets the pride and pleasure evidenced on the day it was opened and, frequented as a loafing place by the lowest element in the community, the building fails to receive the necessary police protection to keep undesirables away. As a consequence the maintenance officer is confronted with a serious problem in keeping these station buildings in a sanitary and presentable shape. To the severe service resulting from the acts of heedless patrons is added the destructive work of vandals whose moral and mental stature is manifested by the obscenities which they carve on the walls of toilet rooms. Small wonder is it, that certain parts of stations soon lose the refreshing newness of a building just completed, that constant effort and attention are necessary to keep them in repair and that eventually they reach a stage of disrepute that gives rise to demands for new facilities.

It is true, of course, that some railroad stations are exceedingly old, that some are poorly lighted and both interior and exterior, are painted in gloomy colors, that the plumbing is of ancient design, that the floors present a worn and splintered surface and that the benches are far from comfortable. Some of these conditions so fruitful of injury to local pride are capable of correction at an outlay far less than the cost of a new station and if corrected would silence much of the criticism. Better light, the use of brighter colors in painting, the renewal of floors, etc., will make a big change in the appearance of the building, while the installation of modern plumbing fixtures will do wonders in removing the antique tone of the place. In some cases it may even pay to undertake a complete remodeling of the station but this must be started before the demand for a new station is well organized, for once the citizens have their minds set for a "new depot" they are hard to appease with any scheme to "fix the old place up."

AN ENVIABLE SAFETY RECORD.—The Chicago Great Western operated throughout the month of October without a reportable injury to any employee, thereby establishing a new record for the system. The Northern division has already gone 105 days without a reportable injury, while the Eastern division has a record of 44 days of freedom from reportable injuries.

A New Line on the B. & M., Replacing Track in the Background Which Was Destroyed Under Load

Floods Cause Havoc and Large Losses to New England Roads

Phenomenal Speed Is Made in the Restoration of Service as Every Resource Was Commandeered in an Effort to Beat the Oncoming Winter

THAT FLOODS and torrents are no respecters of the railroads was again evidenced by the recent floods in New England which brought havoc and destruction to most of the state of Vermont, the whole of the valleys of the Connecticut and Merrimac rivers, and extensive areas in New Hampshire, Massachusetts, Connecticut and New York, and left the railroads for hundreds of miles within this territory partial or total wrecks, with roadways distorted, embankments gone, bridges out, communication disrupted, and with debris strewn over the right-of-way. The storm bringing about this devastation, which occurred on Thursday, Friday and Saturday, November 3, 4, and 5, was the most extensive and costly downfall of rain in the history of this region of New England, raising the water of the rivers from 30 to 40 ft. in certain instances. With it came the inundation of a large number of cities and towns and the destruction of countless miles of highways, in addition to the destruction of railroad property. In some respects, owing to the torrents in the rapidly swollen rivers and streams confined within relatively narrow river basins, the New England flood eclipsed the recent Mississippi flood. This was true particularly in certain localities where the force of onrushing water destroyed practically every type of structure in its direct path. So wide and varied was the character of destruction that analysis of the property losses is still incomplete, tentative estimates ranging from $25,000,000 to $75,000,000. Nor was the flood without its loss of life, for the number of deaths definitely attributed to the flood in the five states affected has been placed at 130.

Like everyone and everything else affected by the New England flood, the railroads were caught unaware; however, in spite of the grotesque destruction and losses incurred, there was no loss of life through train operation. The first sections of railroad lines were put out of service soon after the storm began, and realizing what was coming upon them the roads began to prepare to meet the situation, calling upon all of their available sources of labor, equipment and supplies. With the destruction that followed, putting entire lines completely out of service, rush measures were put into effect and continued in force night and day in order to restore the disrupted service at the earliest possible moment. With innumerable washouts and many bridges gone, many sections of New England were entirely cut off from any character of communication, embargoes were necessary on several of the roads, extensive detours over unaffected lines were the rule, and where service could be maintained, it was supplemented by highway buses in a number of instances.

Since the flood many heroic measures have been put into effect by the roads which, with unabated energy have striven to repair their lines, and while miles of roadbed has been restored or opened to traffic on temporary structures, there are many miles of lines which are so completely destroyed that they are still out of service, and in some instances, cannot be rebuilt until next spring. Fortunately, favorable weather has expedited the work of reconstruction, although the great fear of the roads at the present time is a severe freeze which will greatly retard their work.

Heavy Washouts on the Boston & Maine

The roads most seriously affected by the New England flood were the Boston & Maine, the Canadian Pacific, the Central Vermont, and the Boston & Albany. The Boston & Maine suffered in all of the states affected by the flood with the exception of Connecticut. Parts of its lines were put out of service on November 3, the first day of the storm,

in the Connecticut River valley between White River Junction, Vt., and Wells River, and for some distance south of Bellows Falls. Next came the overwhelming floods in the Hoosac valley in northwestern Massachusetts, southern Vermont and eastern New York. On the second day of the storm, a large number of washouts developed in northern New Hampshire, on both the Connecticut River and the Merrimac River sides of the mountains, and by Sunday night, November 6, there were approximately 100 major washouts on the Boston & Maine's lines in New Hampshire. A map prepared by the Boston & Maine to show the damage to its lines as a result of the flood, indicated tracks washed out at 129 locations, slides at 17 places, 20 bridges or culverts out, 22 bridges undermined or partly out, and track under water at 14 points.

Large Mileage of Lines Affected

On the B. & M. there was a total of 880 miles of line affected, localized mainly on four main traffic routes: The Fitchburg division to the west; the line via Portsmouth, N. H., to Wells River, Vt., where connection is made with the Canadian Pacific to form the Boston-Montreal route via the C. P. R.; the line to White River Junction, Vt., where connection is made with the Central Vermont forming the Boston-Montreal route via the Canadian National; and the Connecticut River line which forms a link in the New York-Montreal route via the New Haven, the Boston & Maine, and then beyond White River Junction, the Central Vermont, or Canadian National.

With so large a territory affected, only the most stringent measures saved the Boston & Maine from long interruptions in its operation. Forces for the reconstruction of the railroad were quickly organized, and a reconstruction program was already under way on November 3, the first day of the flood. So effective was the program planned and carried out that within a week the Boston & Maine had restored to service 646 miles of line, and had carried out this work and handled all of its traffic without having established a single embargo.

The Connecticut River Cut a New Channel at Bellows Falls

In the rehabiliation activity on this road, which centered at Boston in the office of the chief engineer, a system was adopted of making reports from the field to headquarters every two or three hours. All telephone messages were abstracted for a written record and daily reports were sent in each night to form the basis of the requirements for the transportation of men and material.

In handling its work the B. & M. had the advantage of having many intercommunicating branches, which by assisting facilities of access, permitted work to proceed in many places at one time. Almost from the passing of the storm, some 4,500 men were used on major repair jobs, in addition to the full strength of the section gangs which was applied at points where lesser damage occurred. The record shows that up to November 18, the maintenance department had shipped 41 cars of second-hand timber for blocking, 630,000 board feet of bridge timber, 36,000 lin. ft. of piling, 5,600 cars of gravel, sand, dirt and cinders for fills, and 430 cars of rip rap. In one instance material for 500 ft. of trestle was procured and loaded on cars in 24 hours, and at one gravel pit, 100 cars were loaded daily for several consecutive days.

A Stone Arch Washed Out on the B. & M. Line Near Hoosick Junction

Repairs Were Concentrated on Main Routes

Concentrating on the four main routes affected by the flood, all of these routes were restored for through traffic, as far as the Boston & Maine was concerned, by November 21. The main line from Boston to the Hudson river was made passable within one day after the flood had passed, except that motor coaches had to be used to carry passengers between Williamstown, Mass., and Eagle Bridge, N. Y., 21 miles. This line was finally made passable for through trains by November 11, and was at once utilized for the enormous freight movement from the west to New England. In 48 hours after the opening of the line, ending on November 13 (Sunday), 3,235 freight cars, in 56 trains, were moved east from the Hudson river gateways. At North Adams, Mass., 48 miles east of the Hudson river, this line was additionally burdened by a considerable movement of freight from the Boston & Albany. Handling of this extensive traffic was materially retarded by the fact that single track alone was opened at certain stretches, and furthermore, by the five-mile stretch of track at the Hoosac tunnel, over which every train had to be provided with an electric locomotive.

Another serious problem of the Boston & Maine was to move its perishable freight into Boston. This was true particularly in the case of Boston's milk supply which comes from scores of towns on the Boston & Maine lines. By concerted effort, this class

of traffic, which was seriously interfered with at first, was restored almost to normal by November 11.

Canadian Pacific Suffered

The Canadian Pacific was one of the heaviest sufferers in the flood, particularly on its line from Newport, Vt., to Wells River (64 miles), which it acquired from the Boston & Maine. Considerable of the damage on this road resulted from the rise of water to a height where it not only attacked embankments but also flooded cuts, scouring and washing out the track completely. Many bridges on its

Wreckage of Buildings Against a Central Vermont Bridge Near Montpelier, Vt.

line were affected, and for several weeks high water still impeded repair operations and the work of divers employed by the company to ascertain the condition of some of the bridge foundations. Steel bridges on the whole stood up well, only one having failed and that one because of the collapse of an abutment. In addition to the damage to the track structure and bridges, heavy damage was also done on this road to station and signal facilities.

In effecting reconstruction the Canadian Pacific has placed all of its available men and equipment in the affected area, stationing gangs at various points on its line all the way down to Wells River. These gangs are working both northward and southward from St. Johnsbury and include about 1,500 men, supplemented by two pile drivers and a number of steam shovels working in local pits to provide filling and ballast material. Operating with this large reconstruction force, service on the line from Newport to Wells River, for 35 miles southward to Lyndonville, was restored early in the week of November 21, and strenuous measures are under way to restore the line between Lyndonville and Wells River (29 miles); however, the damage on this sector was so heavy that this work cannot be completed for some time. The progress that will be made on this work will depend largely upon the continuance of relatively moderate weather. The Canadian Pacific also suffered some flood damage in the eastern townships of Quebec, but service has been restored in this area.

Canadian National Hit Badly

The Canadian National suffered some losses in the eastern part of Quebec, but damage in this section was of a minor character and delays were only temporary. Its chief problem lies in the damage suffered by the Central Vermont, its United States subsidiary, over which service is offered to both Boston and New York. This route was undoubtedly more unfortunate in its experiences with the flood than most of the other routes in the New England territory. With serious destruction spread over a distance of 94 miles from White River Junction, northward to Essex Junction, it was practically two weeks after the flood before it was possible to make more than a rough estimate of the losses which had been sustained. The first reliable survey indicated that there were a number of steel bridges out, and that at least 25 per cent of the track structure of the road was destroyed.

The severity of the damage done on this road lies in the fact that it had to contend particularly with the rise in the Winooski River valley, which was probably the most seriously affected area in New England. The Central Vermont runs in this valley from Montpelier to Essex Junction and Burlington (41 miles). Its line also parallels the Dog river, a tributary of the Winooski, for about ten miles, the White river for about 40 miles, and also the Connecticut river for a considerable distance.

At the beginning of the week of November 21, two and one-half weeks after the initial washout, the Central Vermont still had 72 miles of its main line out of service, much of it badly damaged and requiring considerable work before it can be restored. In addition to this main line mileage, there is also a considerable mileage of branch line repair work to be completed, which makes a total of about 110 miles of line yet to be put back into service. On this mileage there are four bridges out and several are badly damaged. Much of the track embankment is also gone, and, in fact, there is little of this mileage which does not need some work on it.

B. & A. Tracks Covered With Debris Near Becket, Mass.

Supplemented by the aid of the Canadian National which has placed materials, equipment and skilled personnel at the disposal of the Central Vermont, approximately 2,000 men, including 1,700 track laborers and 125 bridgemen, have been working on this line. Complete outfits, including pile drivers, steam shovels, and work trains bringing in filling materials, ballast and track and bridge supplies, are working northward from White River Junction and southward from Essex Junction. Two other complete outfits are working into Montpelier from the east and on the Montpelier & Wells River, and as soon as these two units reach Montpelier Junction, it is

planned to work one southward and the other northward to meet the outfits working from White River Junction and Essex Junction. In addition to this large amount of equipment, about 35 teams and 40 trucks are also being utilized in the reconstruction work.

Boston & Albany Suffers from Broken Dam

On the double track main line of the Boston & Albany from Becket, Mass., 134 miles west of Boston, eastward, 8 miles to Chester, the roadway was ravaged by the unprecedented flood in this territory and for about three and one-half miles the roadbed was almost entirely washed away, this being due in a large measure to the failure of a reservoir at Becket. Within the distance of eight miles between Becket and Chester, there were 20 bridges crossing the Westfield river, and three of these, a 109-ft. truss, a 65-ft. truss and a 45-ft. stone arch, were washed away. There were also a large number of culverts destroyed in this territory.

In spite of this extensive damage, caused by the flood which reached a depth of 40 ft. or more in this terriotry, the roadway was sufficiently restored so that trains were run through on Tuesday morning, November 15, eleven days from the time the track was washed away. Two tracks were completed for a part of the way, and these were then joined by a single track for 9,200 ft. This is the condition under which the Boston & Albany is operated at the present time in this territory.

Numerous Bridge Outfits Used

The break at Becket, which was by far the most serious on the Boston & Albany, was repaired by four Boston & Albany and three New York Central complete bridge outfits, and the forces of two contracting firms, the latter forces working from the opposite ends of the break. Operating in this manner, the break was joined by a single track and service was restored eleven days after the washout occurred. Owing to this break, the heavy passenger business of the Boston & Albany from Boston to the west was detoured from Springfield, Mass., via New Haven, Conn., Mott Haven (New York City), and then via the main line of the New York Central to Albany, a distance of 268 miles travel to cover the 100 miles of the Boston & Albany's usual route.

Other Roads Experience Heavy Damage

Among the other roads more or less seriously affected by the New England floods were the Maine Central, the Delaware & Hudson, the Rutland, the Montpelier & Wells River, the St. Johnsbury & Lake Champlain, and the White River. Of these roads, one of the most seriously damaged was the Montpelier & Wells River which runs through practically the center of the flooded region. On this line, which extends from Montpelier, eastward 38 miles to Wells River, and has six miles of main line on its Barre branch, six bridges were washed out or made impassable, and four miles of track was completely destroyed, as were also the yards at both Barre and Montpelier. In spite of this serious damage the main line of this road is now open throughout its entire length.

What Was Left of the B. & A. Main Line at Becket

On the Maine Central, operation was halted on the Rangeley branch for 63 miles north of Canton, by high water in the Androscoggin river and its tributaries, which caused many washouts and landslides. Thirty-two miles of track was also shut off by high water on the line from Quebec Junction, N. H., to St. Johnsbury, Vt., and 95 miles on the Mountain division west of North Conway, N. H., was similarly put out of service by high water and washouts. Many of the washouts on these lines were deep, completely inundating the track, and at many other points, landslides completely blocked the roadway. At one point a landslide fell on a long freight train and wrecked a number of cars. A number of bridges on the Maine Central were also damaged by the flood, but by the concentrated effort of its track and bridge forces, all of its lines were back in service within about one week.

The flood damage on the Delaware & Hudson was confined almost entirely to two of its branch lines in Vermont, but both of these lines had long stretches under water for some time and together suffered about 20 washouts. With a single exception traffic on these lines was restored in three or four days, the exception being at Center Rutland, two miles from the terminus at Rutland, where a 450-ft. bridge, 100 ft. above the stream, was carried out. This loss makes the terminus of the Rutland branch at Center Rutland, and buses are being used to carry passengers to and from Rutland. It is expected that the restoration of service at this point will take approximately 80 days.

The main line of the D. & H., from Albany northward to Montreal, on the west side of Lake Champlain, was not seriously damaged, and it is over this line that through passenger business to and from Montreal, which normally moves over the Central Vermont and the Rutland, is now being taken.

Heavy Damage in Vermont

The Rutland suffered in many places throughout the length of its lines in Vermont, and was badly damaged for long stretches south of Middlebury. Between Middlebury and Rutland there were six large washouts where restoration of the line will require some time. South of Rutland there were numerous washouts and one bridge failure, but this part of the line has now been restored to service. Between Rutland and Bellows Falls, a distance of 52 miles, there were 10 major washouts and about 50 smaller ones.

Bridge destruction on this road was confined to three or four structures, the greatest loss being the bridge over the Winooski river north of Burlington, Vt., consisting of three 150-ft. spans, which was practically destroyed. This bridge has now been replaced by a temporary trestle.

The St. Johnsbury & Lake Champlain, extending from St. Johnsbury, west and northward 96 miles to Swanton, Vt., suffered serious damage at many places and the total loss is estimated roughly at $500,000. Washouts in the track caused by far the greatest damage, although a number of bridges and culverts were put out of service. In repairing the damage, four work trains have been in operation carrying men and materials, this equipment being supplemented by a steam shovel and a pile driver borrowed from the Canadian National, a pile driver borrowed from the Maine Central, and by two steam shovels recently released from flood reconstruction work on the Canadian Pacific.

The smallest road affected by the flood was the White River railroad, extending 19 miles between Bethel, Vt., on the Central Vermont, to Rochester, Vt., and doing business with only two locomotives. On this line all of the bridges were damaged but none was entirely destroyed. Three-fourths of the roadway was made impassable however, and reports indicate that the line cannot be restored to service completely before next spring.

Many Agencies Contribute to Reconstruction

The details of the reconstruction of the New England roads cannot be told as yet, for in most instances the work is still going on and there has been no time for thought and reflection. Labor night and day has been the lot of many as the roads have thrown every available resource into the reopening of their lines.

A British Device for Recording Rail Sections

By Major Johnstone-Taylor
Frodsham Bridge, England

American railway men are no doubt concerned with the problem of determining the amount of wear which takes place on rails and for this reason should be interested in the manner in which this is accomplished on the British railways.

One method employed is to make a plaster or wax cast for which the equipment illustrated in Fig. 1 is used. It comprises a double brass frame which is

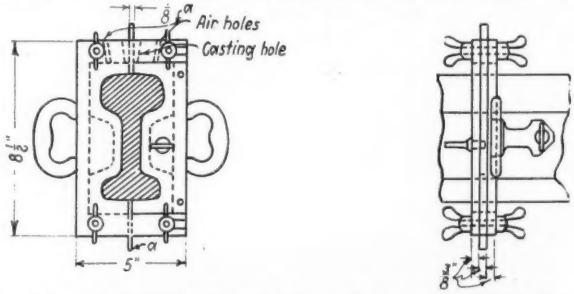


Fig. 1, Mold Used for Making a Plaster or Wax Cast

readily attached to or withdrawn from the rail. Attention is drawn to the brass separators *a a*, the purpose of which is to separate the wax so that it will come off the rail section in halves. In order to obtain a good cast it is necessary to clean the rail thoroughly at the point of application and wet it prior to casting. Then with the mold in place a luting of clay is all that is necessary to complete preparations for a cast. The most satisfactory wax has been found to be a 2:1 mixture of rosin and beeswax. After the mold is withdrawn the back part of the apparatus must be perfectly joined together again with the wax cast still attached and then laid on the recording card so that the outline, which will correspond exactly with the section of the rail, can be carefully traced upon it.

There are many engineers who regard plaster or wax casts with suspicion owing to the inevitable contraction of the casting material and for this reason the machine shown in Fig. 2 is of interest. This comprises a rod *a* which has a free vertical and axial motion and is held

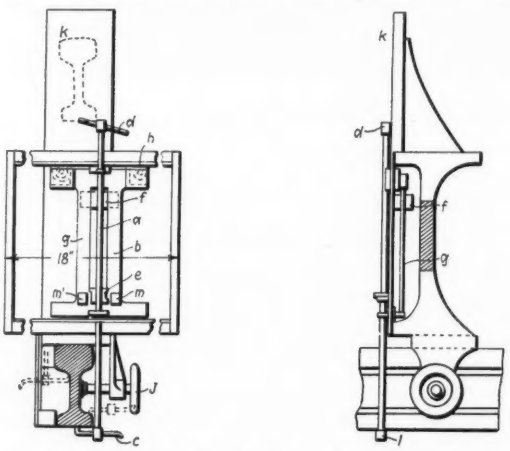


Fig. 2, A Rail Section Recording Machine

by carrier *b* which is free to move horizontally. To the bottom of rod *a* is fitted the cross arm *c* which will be seen to have two points, the function of which is indicated by the dotted outline. To the top of the rod is attached a cross arm *d* and this has two hardened needle points at each end which are adjusted when in contact with the paper affixed to the tracing board to correspond with the position of their respective tracing points below. Attention is now directed to the sliding block *e* in which the boss of the tracing rod is free to turn. It is attached to a cord passing over a pulley to box *f*, located between guides *g g*. This box is filled with shot to balance the weight of the tracing rod and its arms. In order to steady the horizontal motion of the carrier, the upper wheels *h* are fitted to a sliding axle box backed by springs capable of adjustment by thumb screws.

The machine functions as follows: After oiling the rail thoroughly it is clamped to it by screw *j*. A paper is pinned to the tracing board *k* and the operator, sitting astride the rail and facing the front of the machine, takes hold of the boss *l* between the right finger and thumb and guides the pointer *c* across the under surfaces of the rail, at the same time placing two fingers of the left hand on the two finger rests indicated at *m m* so as to steady the horizontal motion of the carriage. With the pointer the lower curved surfaces and the web on one side of the rail can be followed. Then with the carrier run to the end of its path, the rod being clear of the tracing board, the latter may be turned around on its axis so that the downward pointing end of *c* can be made to follow all the upper curves on that side of the rail and join up to the lines already made. The rod may be then passed over to the other side of the rail and the process repeated, the whole operation occupying about four minutes. The paper is then taken off the board and the section traced later in the office, when a comparison is easily made with either the original section or any previous section to show the wear that may have been taken at the point in question.

Supporting a Turntable Circle Wall on Concrete Cylinders

By PHILIP GEORGE LANG, JR.
Engineer of Bridges, Baltimore & Ohio, Baltimore, Md.

RAILROAD turntable replacements, within recent years, have introduced engineering problems of peculiar interest and importance. In the majority of cases the new tables are considerably longer than those removed, and the scene of the work is usually a busy terminal or division point, where the uninterrupted use of the engine facilities is a matter of prime importance in the operation of the railroad.

The exigencies of such a situation, which frequently involves the replacement of an 80-ft. or 100-ft. turntable with one from 25 to 40 ft. longer, require the enlargement of the pit, sometimes a shift of the center, and, in every case on an operated railroad, the minimum interference with the use of the terminal facilities. To attain these results, it is necessary that every stage of the work, including the extension of the pit, the operation of the old turntable during the progress of the work, the removal of the old table and the installation of the new, be determined carefully in advance, and carried out in strict conformity with the schedule developed.

Unforeseen conditions are sometimes encountered in connection with work of the nature mentioned, which, when they occur, demand a measure of resourcefulness on the part of the engineer. Among these factors may be mentioned foundation conditions, which have a bearing of obvious importance on the procedure followed in the performance of the work, and also on the stability and permanence of the completed table. Recently the Baltimore & Ohio undertook the replacement of a 100-ft. balanced type turntable at Connellsville, Pa., with a new turntable of the three-point support type, 115 ft. in length. The project involved the reconstruction of the ringwall to the larger diameter necessary to accommodate the new table, and the work was prosecuted under the difficulties imposed by its location in the midst of a busy terminal.

As the excavation progressed, it was discovered that the character of the underlying strata within the area of the pit was not uniform. Beneath about two-thirds of the new ringwall the material was such as to afford suitable footing without the use of piles or other special sustaining media. The soil beneath the remaining section consisted of about 18 inches of cinders, which rested upon a clay fill, approximately five feet in depth, containing numerous small, round stones. Beneath this fill the soil was interspersed with pockets of clay and loam, so saturated with water as to evince a disposition to flow and to compromise the stability of the footing. This irregular stratum averaged six feet in depth, and rested upon sand and gravel, which afforded an excellent foundation.

Excavation for the full dimensions of the new ringwall throughout the affected section would have been uneconomical, and the use of concrete piles was considered. This latter expedient was definitely abandoned, as the piles used would necessarily have been extremely short, and no penetration in the underlying gravel could be secured, as it was impossible to drive a bar or pipe into this material. The expedient finally adopted was the use of steel cylinders of 48 in. inside diameter, composed of No. 16 gage material. Each section was 48 in. in length, provided at each end with a band, to permit jointure to other sections and also to insure the rigidity of the cylinder against earth or water pressure.

Cylinders Provided Adequate Working Space

Cylinders of this character were recommended by their lightness, which facilitated handling, and by the fact that they would exclude the water, and were of sufficient diameter to provide adequate working space. The cylinders were fabricated at Baltimore, Md., and shipped to the site of the work. Their adoption was amply justified by the success which attended their use. When the first cylinders were sunk, the excavation was performed by manual labor,

three workmen being required for each caisson, and the sinking progressing at the rate of approximately one foot per hour. At an early stage of the work, however, an orange peel bucket, 30 in. in diameter when open, with 2½ cu. ft. capacity, was obtained, and used for the removal of the material during the remainder of the operation. The progress attained by the bucket was at the rate of approximately 2½ ft. per hour. In conjunction with the use of the bucket, three men were employed, namely a crane operator, one man to operate the guide line and another to dig out the material beneath the cutting edge of the caisson. These men also found it necessary occasionally to straighten or plumb the cylinders.

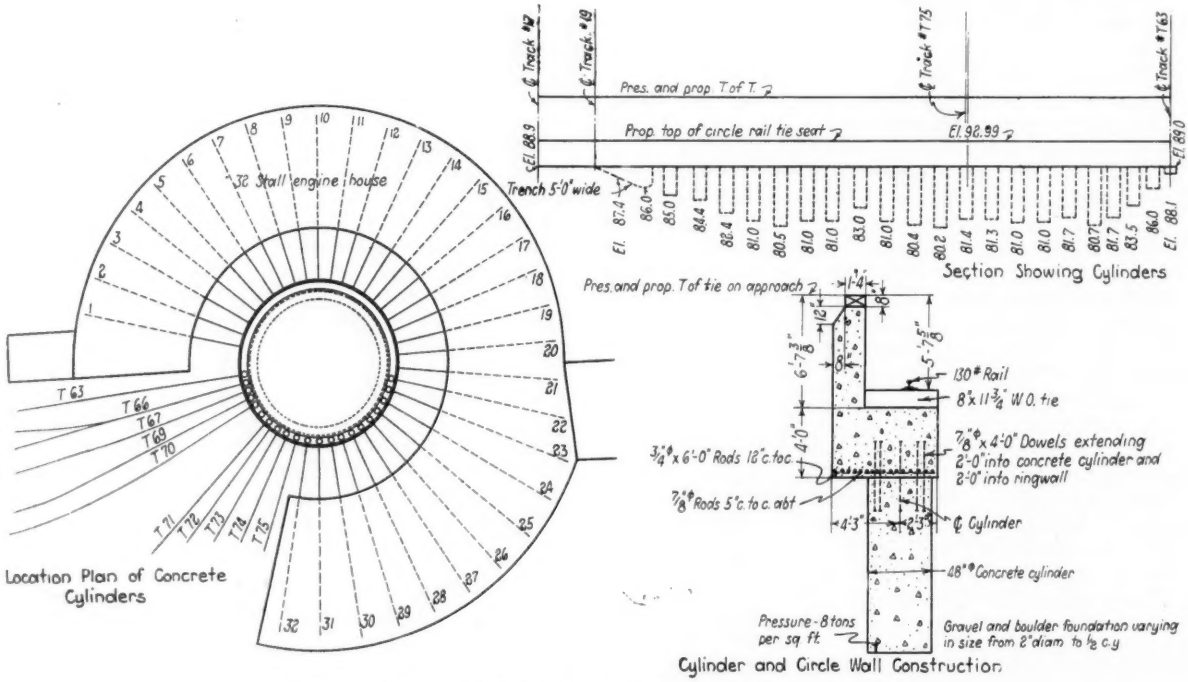
The work was somewhat retarded by the ingress of water, which continually poured into the bottom of the excavation, and the material removed was of a muddy consistency. While the work was actually in progress the operation of the bucket was sufficient to keep the water under control, but, after the cessation of operations for an appreciable length of time, it was necessary to remove the water by means of a steam siphon.

Little Trouble with Water

The sections of the cylinders projecting above the footing level after reaching solid material were removed by means of a torch. The cylinders, after reaching suitable footing, were filled with concrete, which assumed the shape of a series of pedestals, 48 ins. in diameter, transmitting the load from the circle wall to the gravel foundation. Operations were continued in this manner until a total of 21 cylinder-caissons, of the character described, had been placed for the support of the new ringwall along the section affected by adverse foundation conditions.

Clamshell Bucket Used for Excavating Caissons—Note Boulders Removed in Foreground

at this point in a manner which was not only economical in first cost but permitted the work to proceed rapidly, and provided a satsfactory foundation for the circle wall, the cylinders forming, in effect, a



Plan of Roundhouse and Turntable Wall Showing Location of Cylinders Cylinders, Footing and Circle Wall Shown in Section

The use of thin steel cylinders, which were light in weight and easy to handle, in conjunction with a small-size orange peel bucket, solved the difficulties series of columns spaced 8 to 10 ft., center to center, for the support of this circle wall, which was designed as a beam.

Roads Award Prizes

WITH THE passing of the season of annual track inspection, reports are appearing of the awards made to supervisors and foremen whose subdivisions and sections received the highest ratings or showed the greatest improvement over preceding years. As we go to press such reports are available from two systems, the Pennsylvania and the Norfolk & Western and are presented here.

Pennsylvania Awards Prizes

Following the general managers' annual inspections, which supplement periodic inspections by committees of operating officers, the Pennsylvania has announced the award of annual track prizes on its main line divisions of the Eastern, Central and Western regions.

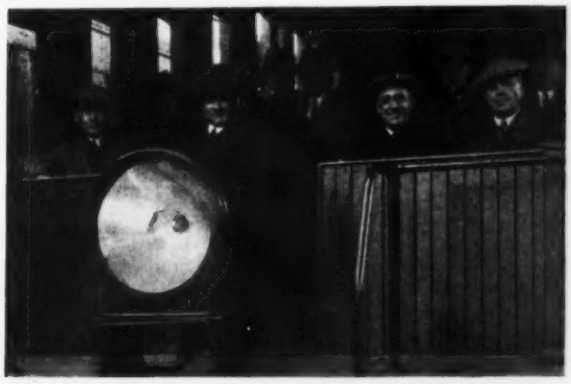
In the Eastern region these prizes total $4,600. The largest prize, known as the "Klondike" prize, which is awarded to the supervisor's territory maintaining the best line and surface between New York and Altoona, Pa., and between Philadelphia, Pa., and Washington, D. C., was won by J. F. Swenson, supervisor, and L. E. Gingerich, assistant supervisor of division No. 32 of the Philadelphia division at Lancaster, Pa. This prize amounts to $1,200, of which the supervisor receives $800 and the assistant supervisor $400.

The "Improvement" prize, amounting to $1,000 and given to a supervisor's territory for the greatest improvement made during the year in line and surface, was awarded to J. D. Lovell, supervisor, and R. W. Sheffer, assistant supervisor of division No. 44 of the Middle division at Hungtingdon, Pa. Of the total award, Mr. Lovell's share was $700, while that of Mr. Sheffer was $300.

In addition to the two main prizes mentioned, three additional prizes of $800 each were awarded to the supervisors and their assistants maintaining the best line and surface on the three general divisions making up the main lines between New York and Altoona and Philadelphia and Washington, excluding the territory which won the "Klondike" prize. These prizes, which amount to $600 for the supervisor and $200 for the assistant supervisor were awarded as follows: J. C. White, supervisor, and H. C. Pritchard, assistant supervisor, on the Middle division at Tyrone, Pa.; C. O. Long, supervisor, and R. H. Meintel, assistant supervisor, on the New York division at Trenton, N. J.; and W. T. Bevan, supervisor, and E. M. Arndt, assistant supervisor, on the Maryland division at Perryville, Md.

In the Central region the Pennsylvania has awarded a total of $3,600 to 15 of its track supervisors. The first prizes of $800 and $400 were awarded respectively to W. W. Portser, supervisor and to Joseph Summers, assistant supervisor on subdivision No. 12 on the Pittsburgh division, Trafford, Pa. The next two highest prizes of $600 each, awarded to supervisors having maintained the best line and surface on main line divisions other than that receiving the first prize, were won by D. E. Callahan, supervisor of Sub-division No. 1 of the Eastern division, Pitstburgh, Pa., and R. L. Chaney, supervisor of Sub-division No. 4 of the Panhandle division, at Dennison, Ohio. Supplementing the prize won by Mr. Chaney, F. A. Dever, assistant supervisor on the same sub-division received $200.

Additional prizes of $100 each were awarded to the following branch line supervisors: C. G. Grove, Buffalo division, East Aurora, N. Y.; C. J. Code, Allegheny division, Oil City, Pa.; T. M. Woodward, Renovo division, Kane, Pa.; F. H. Rothe, Pittsburgh division, Pittsburgh, Pa.; W. P. Critchfield, Conemaugh division, Blairsville, Pa.; W. W. Patchell, Monongahela division, W. Brownsville Junction, Pa.; James Foley, Wheeling division, Wheeling, W. Va.; C. P. Willis, Cleveland and Pittsburgh division, Ravenna, Ohio; S. C. Hofmeister, Erie and Ashtabula division, Jamestown, Pa.; and M. J. Bray, Akron division, Orrville, Ohio.



Pennsylvania Officers Making Annual Track Inspection on the Eastern Region

Left to right, front row—E. W. Smith, general manager; W. T. Covert, chief engineer maintenance of way; H. H. Garrigues, general superintendent; and C. S. Krick, regional vice-president. Right to left, second row—W. M. Wardrop, and J. O. Hackenburg, general superintendents.

In the Western region, Delphi Lewis, supervisor of Subdivision No. 4 on the Columbus division, with headquarters at Richmond, Ind., received the first prize of $800 for the subdivision having the best line surface. Allen F. Roper, supervisor of Subdivision No. 2, Cincinnati division, was awarded the prize of $700 for the subdivision showing the greatest improvement in line and surface during the year. In addition to the above, three prizes of $600 were awarded to supervisors whose subdivisions were judged to have the best line and surface on each of three divisions. The prize on the St. Louis division was given to B. J. Boyle, supervisor of Subdivision No. 2, with headquarters at Terre Haute, Ind. On the Fort Wayne division it was awarded to E. B. Kirchner, supervisor at Van Wert, Ohio, and on the Logansport division to Charles McCarthy, supervisor at Union City, Ind.

Norfolk & Western Makes Awards to 85 Foremen

The annual roadmasters' track inspection of the Norfolk & Western resulted in making cash prize awards to 85 section foremen, these awards ranging from $40 for first prizes to $10 for fourth prizes. They were made to the foremen on each supervisor's sub-division whose sections received the first, second, third and fourth highest ratings in the annual inspection, a rating of 10 representing perfection.

The two sections receiving the highest average ratings were Section 19, Roadmasters' division No. 16 of the Pocahontas division, Charles Felty, foreman, at Neal, W. Va.; and Section 10, Roadmasters' division No. 14 on the Radford division, B. Puckett, foreman, at Cleveland, Va. The rating of Mr. Felty's section was 9.44, while that of Mr. Puckett was 9.41. In each instance this year, each grand division showed a higher rating than that in 1926, and the general average for all divisions was given as 9.04 this year as compared with 8.75 last year.

Developing Water Supplies in a Region of Bad Water*

A Description of the Manner in Which the Canadian National Overcame Adverse Conditions in the Northwest

By J. W. PORTER
Special Engineer, Canadian National Railways

DURING the first two decades of this century, railways were built throughout the prairie provinces of Canada at a rate never before equalled, and many facilities were permitted to assume a temporary character in order that the energy and financial resources of the builders might be applied to the work of extending the lines into the rapidly developing country to serve the settlers who were coming in by hundreds of thousands. By the time this period of railway construction was slowing up, the world war came on and put an end to all development.

It was 1920 before the Canadian National System was able to give serious consideration to the problem of water supply betterment. Of course, during the period just mentioned the long stretches across the prairies had to be provided with water and where the lines were near enough to lakes or followed some of the river valleys, the solution was easy, as they could generally be tapped at reasonable cost and the quality of the water, with a few exceptions, was suitable for boiler use. At other points on the bald prairies, shallow wells, deep wells and galleries were sunk, and while some of them proved satisfactory, from the standpoints of both quality and quantity, many lacked one or the other of these virtues and some both. Where water was scarce, or lacking altogether, the water car had to be put into service. Where the quantity was sufficient but the quality bad, it was generally used, but a large percentage of operating revenue was consumed on account of frequent boiler washouts, flue repairs, and renewals, not to mention increased fuel bills, loss of time in getting over the division, and many other items of cost that follow in the wake of inferior water.

The ground water in western Manitoba, Saskatchewan and most of Alberta, while satisfactory for drinking and culinary purposes, frequently leaves much to be desired as boiler water. Some waters are heavily charged with calcium or magnesium salts, forming a heavy scale, while others contain too much sodium salts, thereby causing foaming. Others again contain both incrusting and non-incrusting solids in large quantities and are unusable. There are few locations favorable to good ground water supplies, that is, where the soil and subsoil are of a fine sandy character, and the district is one of ample precipitation.

In making a study of water problems, economic conditions had, of course, to be taken into consideration. The principal products of western Canada are grain, cattle and coal and the larger proportion of these commodities, under present conditions, must be moved between September and January inclusive. Hence, a water station must be able to produce from four to six times the daily requirements of the spring and summer.

It was realized that the water at many points could be treated and brought to a satisfactory standard but it was found impossible in most cases to increase the supply to take care of the heavy traffic period, which each year is becoming heavier. Sometimes a well would dry up, and this would occur, as a rule, just when water was most required; hence this source of water supply was looked upon with suspicion.

A water supply, to be satisfactory, should fulfill the following conditions: 1. Be depended upon to deliver enough water to take care of traffic at all periods. 2. Produce water of a satisfactory quality or at least be amenable to treatment.

As the ground supply in most cases could not fulfill either of these requirements, it was decided to investigate the surface supplies. After careful consideration and investigation, it was decided to impound the spring run-off in various coulees that are so common in western Canada. As a rule there is a fairly heavy winter precipitation in the form of snow, which drifts into these coulees and ravines and produces an enormous run-off in early spring while the ground is frozen.

Small Coulees Were Selected

Perhaps the most interesting feature that has been developed during the past seven years is the type of coulee used in which to impound water. Prior to 1920, many dams had been built in western Canada but most of these were on large coulees and ravines, where the discharge, if not continuous, could be depended upon to flow for a considerable part of the summer and occasionally again in the fall. Unfortunately this type for the most part produced a poor quality of water owing to the fact that their beds were at or below ground water level. After considerable field research work had been done, mostly in measuring the early spring discharge of the smaller coulees, it was decided to use this type almost exclusively, where they were available, even where a considerable length of pipe line had to be laid to utilize them.

Before money was made available for any of these projects, it had to be demonstrated that there was a substantial economic advantage for each proposition and results have confirmed our figures. At Regina, for example, where our reservoir supply replaced city water, the annual saving is from $30,000 to $50,000. At Melville it is probably double this amount. At Raymore the plant paid for itself in three years, and at Scott in less than a year, and as soon as our program is completed, the total saving in operating costs, will run into hundreds of thousands of dollars annually.

We have proceeded on the theory that a drainage

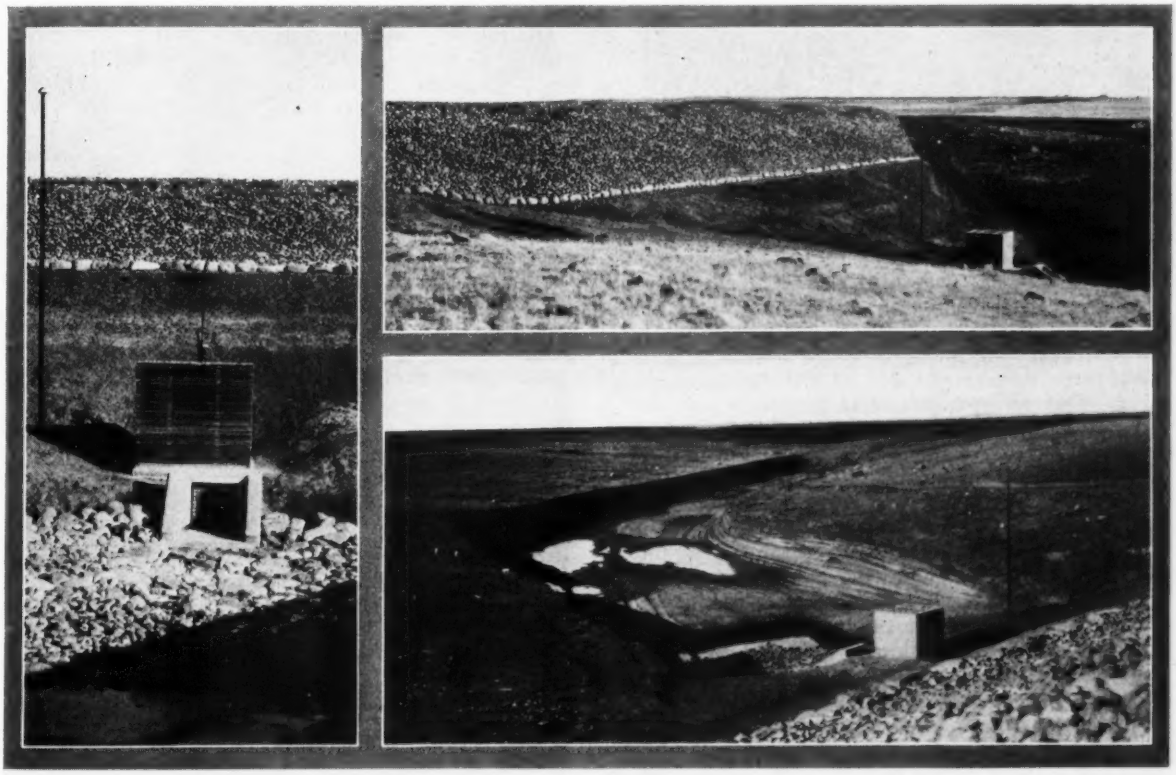
*Abstracted from a paper presented before the convention of the American Railway Bridge and Building Association at Minneapolis in October.

area, to be satisfactory, must deliver enough water from the spring "run-off," after a winter of the lightest probable snowfall, to fill the reservoir. This point has been stretched in a few cases where a deep reservoir of large capacity in relation to probable consumption could be obtained. In such a case the reservoir, when once filled, will take care of from two to three years consumption.

The standard methods for figuring anticipated run-off are not applicable to the drainage areas that we are interested in. The ravines selected were generally above the ground water plane, and therefore were only affected by the comparatively small proportion of precipitation that runs off as surface flow. Occasionally, in such areas a whole summer seepage of inferior water with scale-forming or foaming tendencies; attention heretofore was not always given to this significant factor. A ravine with a limited drainage area tributary to it, but sufficiently large so that the reservoir will fill up each spring from melting snow, will provide a water of good quality and the cost of the necessary works will usually be reasonable.

Earth Dams Were Built

All dams were constructed of selected material after a thorough study and examination of the surface and sub-surface conditions at the site were made. Although it is not essential in an earth dam to have it all of impervious material, we were



The Dam at Darmody showing the Intake (at right), the Upper Side of the Dam (at top) and the Excavation in the Coulee (at bottom)

passes without any run-off from rain, hence we were forced to consider only the spring run-off from melting snow. In each individual case, estimates were made of the probable minimum discharge in the spring, taking into consideration the latitude, topography, soil, vegetation and slope of watershed, and the known or estimated minimum snowfall. This estimate was always supplemented by actual measurement of at least one spring run-off. While such a measurement in itself is not conclusive (unless taken after a winter of very light snowfall) one can compare the snowfalls of preceding winters with probable minimum winter precipitation and use this ratio in arriving at a minimum discharge.

While our object was to get a large visible supply of usable water, the site that would impound the best quality was always used, often at a considerable increase in cost for the delivery pipe line. Where possible, ravines were selected whose beds were above the ground water plane, thus preventing the fortunate in being able to obtain this material at all sites, either from excavated material in the reservoir or from a borrow pit in close proximity to the dam. After stripping all vegetation and top soil from the dam foundation, a cut-off trench was excavated through the more or less porous stratum down to hard pan or impervious material, and then backfilled with puddle. The slopes used on the upper face of the dams are 3 to 1 and on the lower face 2½ to 1. Any porous material encountered was placed on the downstream side, so that it might have the effect of reducing the hydraulic gradient of seepage water if such existed. The top width of the dams ranges from 16 to 20 ft. with from 8 to 10 ft. freeboard, in most cases the latter. All dams were constructed in layers and watered consistently during construction. It was found unnecessary, however, to use any special device to consolidate the material as wagons and horses did this service satisfactorily while hauling over it.

Special care was taken in consolidating the puddle in the cut-off trench, packing being performed by horses being led back and forth while the puddle was being placed, and so far no leakage has been observed at any of the dams. The water impounded in these reservoirs amounts to nearly two billion imperial gallons.

The upstream slope generally has a face of coarse gravel to form a bed for the hand-placed riprap for

The Regina Reservoir Filled

the protection of the dam from wave action. The bottom of the riprap rests upon a shoulder or berm in the embankment, otherwise the weight of the riprap might be sufficient to cause it to slide down the saturated face. If gravel was plentiful the lower face was also coated with it and in some cases it was seeded, where top soil was available. We have found it very desirable to place a rubble wall in these earth dams about 2/3 of the distance through them. This serves a three-fold purpose:

1. It is a well defined principle of earth dam construction that the function of the lower third is to keep the other two-thirds in place. A rubble wall lowers the hydraulic gradient of seepage waters, thereby keeping the lower third of the dam dry.

2. As the wall is built up to the flow line it effectually prevents burrowing animals from digging from the lower face to the water.

3. We have found it convenient and economical to place pumphouses immediately below the dam, thus saving the expense of a suction well and also having a considerable head on the top of the pump which in the case of a centrifugal pump is very desirable. By constructing a rubble wall in the dam the seepage water is controlled and discharged into the bed of the coulee below the dam, thus keeping the material around the pumphouse quite dry.

Guard Against Burrowing Animals

Burrowing animals, particularly muskrats, have been blamed for the failure of many earth dams, most of which have occurred in minor structures, principally in old canal banks. If the core wall is extended above high water mark, there is nothing to fear from them. While if the upstream face is protected by riprap they will have little opportunity to injure the embankment. Also it has been found if the material in the dam is compacted thoroughly the muskrat will go elsewhere for a home. The freeboard and top width of high earth dams are generally so great that the muskrat does not burrow through to the downstream face.

In recent years, considerable data have been published on the design of earth dams. However, if a dam is designed to meet the following requirements and proper attention given during construction, it should prove as permanent as any other structure:

1. The upstream and downstream slopes must be such that with the materials used in the construction, they will be stable under all conditions.

2. There must be no opportunity for the free passage of water from the upstream to the downstream face.

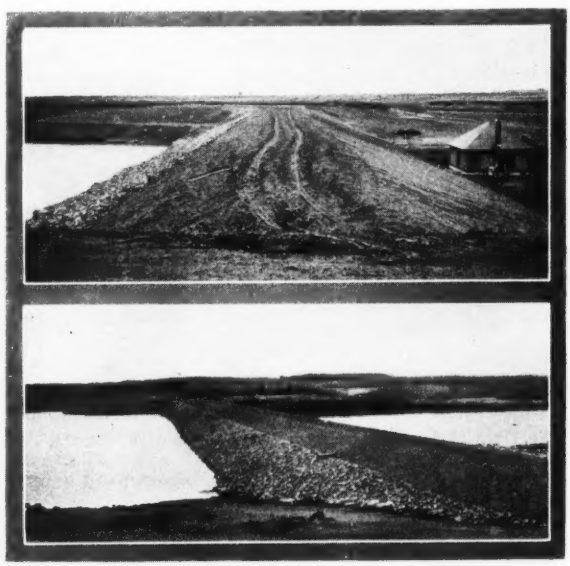
3. Water which passes through and under the dam must be properly taken care of below the toe, so that it is incapable of washing away any of the material which the dam or its foundation is composed of.

4. The freeboard must be such that there is no danger of over-topping by wave action.

5. The spillway capacity should be ample so that it can take care of all excess water during the flood periods.

Spillways Were Built With Care

In order to take care of excess water during the heavy run-off periods we have constructed a by-pass or spillway, with ample capacity and located as a rule, at some distance from the dam. A low point in the ravine bank usually offers a satisfactory location. A cut is made through it and carried around to the original water course at a safe distance below the dam. In the earlier plants the by-pass cut was riprapped on the bottom and sides, but it was found very difficult to get rock heavy enough to remain in place, and the result was that extensive repairs had to be made after the spring flow. Recently concrete spillways have been constructed, the open



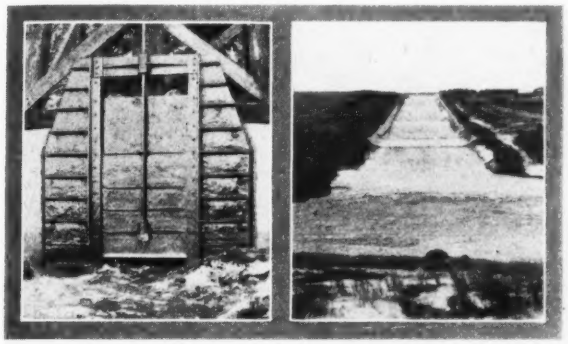
Euclid Dam and Pump House
The Scott Reservoir Filled

type on the larger coulees and the culvert type on the smaller ones, with an emergency spillway 3 ft. below the crest of the dam, and so far these have given satisfaction and the cost has been little more than the former on account of the greater gradient that can be used, thus making them shorter.

In the spillway at Conde concrete blocks seven feet square and six inches thick, reinforced with light mesh, were used to replace riprap. Side slopes are designed and reinforced as slabs. To prevent sliding, anchor walls are placed at intervals, and these project above the finished paving to act as baffles which keep the velocity of the water normal. This spillway was built on a 4 per cent grade, but

where the topography allows, the grade should be increased to double this or more. A very large discharge has to be taken care of each spring at this point, and this type of construction is well adapted for it.

At Avonlea, the spillway channel is lined with concrete in sections 16 ft. in length, each section designed and reinforced as a slab, the upper sections lapping one foot over those next lower to allow for expansion and heaving. Anchor walls to prevent sliding and a water cushion are also provided. This type is adaptable to small ravines where the discharge is not so great, and where very steep grades are possible, 15 to 25 per cent being allowable for this design. Side slopes are put in at 1 to 1 where no forms are used.



Culvert Gate at the Scott Reservoir

The Regina Spillway in Service

Exposed entrances to spillways are protected by a log boom attached to piles. This arrangement prevents the ice from blocking up the mouth of the channel in the spring. Special precautions have to be taken at those spillways which are packed with snow and ice, by cutting channels through them to give the water free passage. Permanent snow fences are now erected to prevent snow drifting into them.

Scour Pipes Were Provided

In order to maintain the quality of the water in these reservoirs a scour pipe of suitable size is carried through in a trench in the natural ground under the dam. It is embedded in a slab of concrete, and seepage checks are provided every 12 ft. for about two-thirds of the distance. A combined concrete valve chamber and well, carried up through the dam, controls this scour pipe. In the later dams control is in the pumphouse. In the late winter before the run-off takes place, it is thereby possible to empty the reservoir and allow it to fill up again with new water in the early spring, thus preventing the concencentration of soluble solids through evaporation. Pipes should never pass through the earth embankment.

In several cases where the pumphouse is located below the dam the feed pipe is also carried in the same trench as the scour pipe, embedded in the same concrete slab, and turning into pumphouse near the lower toe of the slope. This arrangement has proved very satisfactory as well as economical.

In addition to the scour pipes at Rama and Conde, the quality of the water is maintained by by-passing the late flow in the spring and preventing the good water from being contaminated in the reservoir. At these points the ravines are at or slightly below the normal elevation of ground water. This results in the coulees discharging for a considerable period after snow has disappeared. When the discharge is small, the quality is very bad, and when the discharge is large, the quality of the water is comparatively good.

A weir was constructed at the upper end of the reservoir and above this a foul water ditch was constructed which carries the water around the reservoir and returns it into the coulee below the main dam. The results obtained from this expedient were satisfactory as can be seen by the following comparison of analyses:

	Foaming Solids Grains per Imp. Gal.	Incrusting Solids Lbs. per 1000 Imp. Gallons
Rama, Sask.		
Reservoir	5.1	0.6
Foul water ditch	39.3	11.1
Conde, Sask.		
Reservoir	6.1	2.2
Foul water ditch	19.3	9.7

A variety of equipment has been used in pumping plants. One of the best installations is at Conde where we have an electric motor and a three-stage centrifugal pump, power being obtained from Regina over an eight-mile transmission line. This type of plant is particularly desirable from a maintenance standpoint and where power can be had at a reasonable cost. At other points where the plants are located below the dam we have centrifugal pumps operated by Diesel type oil engines (cold starting) which use the cheaper grades of oil successfully. This type of plant is compact and has proved very satisfactory.

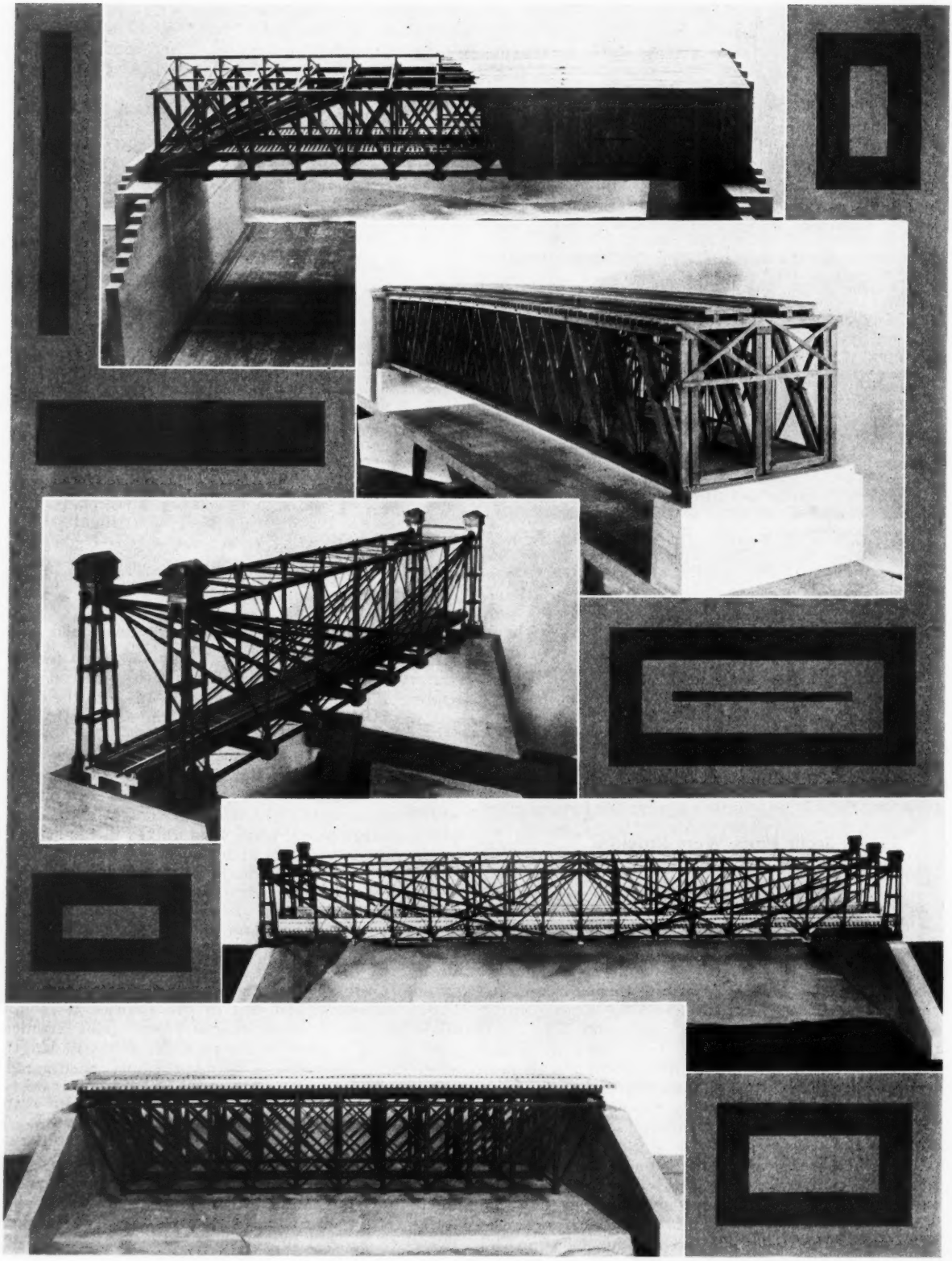
A Few Gravity Supplies Were Developed

While gravity supplies are uncommon in a prairie country, we were fortunate enough to locate one at Kipling and another at Avonlea. Although the head is low at both of these points (the former having a 35-ft. maximum and a 10-ft. minimum and the latter a 40-ft. maximum and a 25-ft. minimum) they are functioning satisfactorily. They were constructed in 1923. In both cases concrete headworks were constructed in the dams to control both scour and discharge pipes, while float valves in the service tanks control the latter under normal conditions. We have just completed another station at Dunblane with a reservoir capacity of 180 million gal. and a head of nearly 100 ft.

Delivery pipe lines from reservoirs vary in length from a few hundred feet to seven and a half miles. Practically all of them are cast iron pipe from six to eight inches in diameter, for owing to the corrosive nature of the soil in the prairies it is not advisable to use wrought iron pipes. The Avonlea pipe line is a wood stave pipe 2½ miles in length and 6 in. in diameter. This, as previously mentioned, is a gravity line with a low head and the soil is fairly free from corrosive salts.

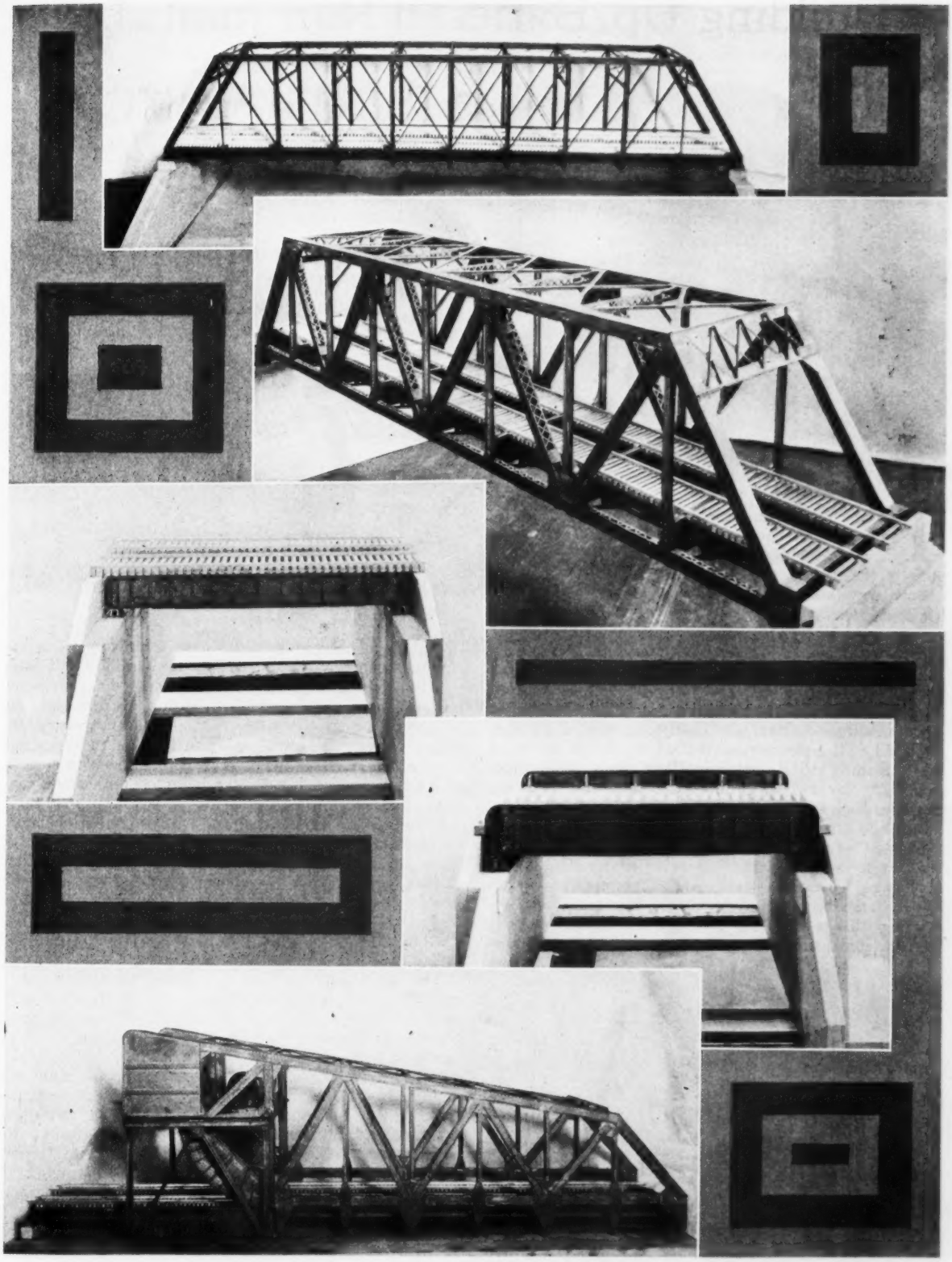
All work described was carried out by engineers of the Western Region under the direction of H. A. Dixon, chief engineer. The necessary surveys and reports for location of dams and reservoirs were made by T. C. Main, division engineer, who also designed the details of spillways, etc. The writer exercised general supervision.

TUNNEL CAVES IN.—The Kettle Valley was blocked for five days between Hope, B. C., and Brodie when a tunnel near Iago, in the Coquehalla Pass, caved in on October 27 while workmen were facing its sides with masonry. More than 8,000 cu. yd. of rock were removed before service could be resumed.



BALTIMORE & OHIO DEPICTS PROGRESS IN BRIDGE DESIGN

At the top: Wooden arch-truss bridge built in 1838-9 over the Patapsco river at Elysville, Md., according to a design prepared by Benjamin H. Latrobe, then chief engineer of the Baltimore & Ohio. Upper right: Deck Howe truss bridge patented in 1840 by William Howe and used extensively by the railroads up to recent times. Center left: The Bollman truss, patented in 1850 by Wendel Bollman, a B. & O. engineer. It is really a combination in which a separate triangular truss is provided for each panel point. Lower right: The Fink truss patented by Albert Fink while in the employ of the B. & O. He later became a prominent railway officer. Trusses of this type were in service in the Pennsylvania bridge over the Ohio river at Louisville until 1919. Lower left: The Whipple truss, introduced in 1847 by Squire Whipple, one time a rodman on the B. & O. and later an engineer of note. Trusses of this type are still in service on a number of American railroads.



DEVELOPMENT ILLUSTRATED BY MODELS AT CENTENARY EXHIBITION

At the top: A typical example of a pin-connected Pratt truss through span. This type of truss was developed by Thomas and Caleb Pratt in 1844. In its original form it was a combination timber and metal structure, but its widest use was an iron and later a steel bridge, first with pin joints and ultimately with riveted connections. Upper right: A Warren truss span, a type now in general use for riveted trusses. Originaliy this was built without the vertical web members. The longest span of this character on the B. & O. is a 434-ft span in the Alleghany River bridge at Pittsburgh. Center left and right: Deck and through plate girder spans. Girders built of wrought iron fabricated in England at least 80 years ago and which carried B. & O. tracks for many years, are now in service in a highway over-crossing. At the bottom: A Scherzer rolling lift span, one of several types of bascule bridges employed extensively by numerous railroads over navigable streams.

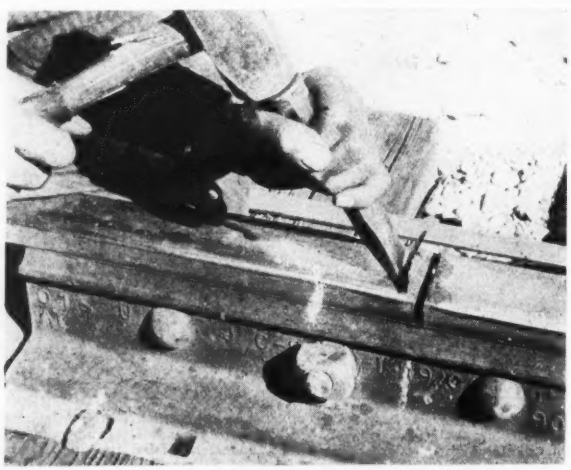
Building Up Battered Rail Joints by Electric Arc Welding

This Process Is Being Employed on Roads in the West with Satisfactory Results

An Electric Welder and an Example of His Work

THE economies to be obtained by welding battered or chipped rail ends in track have been demonstrated so thoroughly that the practice has been widely adopted by the railways of this country, as was evidenced by the review of this subject which appeared in the September, 1926, issue of *Railway Engineering and Maintenance*. Heretofore, the oxy-acetylene torch has been employed almost exclusively in carrying on this work, but in recent developments the electric arc is also being used with good results. So far, the electric method has been confined to the western states, where the preliminary work leading to its adoption has been done independently by two organizations, one, the Welding Service, Inc., of San Francisco, Calif., and its associates, the Morrison-Knudsen Company, railway contractors, Boise, Idaho, which have formed a subsidiary, The Electric Rail-Weld Service Corporation Railway Exchange, Chicago, to take over the promotion of this service, and the other, the Southern Pacific.

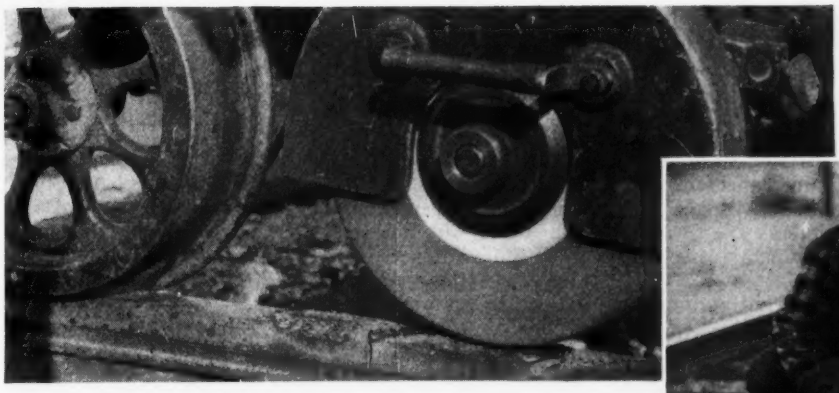
The outfits used by The Electric Rail-Weld Company were designed after two years of extensive experimentation in the laboratory and in the field, this work including exhaustive tests under actual traffic conditions with various combinations of metals to determine the proper compositions to withstand the severe service to which the welds were subjected. The outfits were then placed in regular service in 1924, first on the Western Pacific and later on other western roads. They consist of a gas engine and generator mounted on a track car, with the necessary conductor cables and grinders. The car has a steel chassis and is equipped with small double flanged transverse wheels for removing it from the track to a platform built of ties or other timber, clear of traffic. Conductor cables to form the circuit are strung along the track near the ends of the ties, the cable being of sufficient length to enable the joints on one mile of track to be welded from one set-off without moving the machine.



Chipping Off Laminated Metal Before Welding

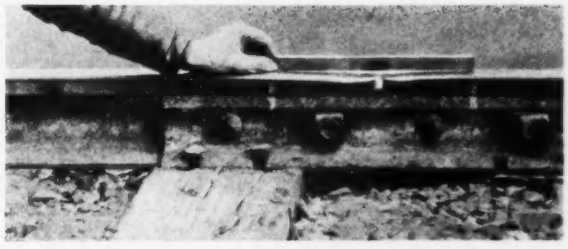
The main welding unit consists of a 40-hp. four-cylinder gas engine direct-connected through a clutch to a 250-ampere welding generator, with a grinding generator and exciter direct-connected to the extended shaft of the welding generator by flexible couplings. The grinding machine has been developed especially for this work and, as shown in the illustration, the grinding wheel and motor are mounted on a second car which is rigid but light enough to be removed easily from the track for trains. The frame of this car is built of aluminum castings and steel tubing, while 14-in. wood-center wheels are used for insulation. A hand grinder of 1/3-hp. capacity with a wheel $\frac{3}{16}$ in. thick is also used to bevel the rail ends after the surface grinding has been completed.

A welding gang consists of two welding and grinding units in charge of a foreman, each unit having a welder, a grinder, an engine tender, a helper and one or more flagmen as required by the nature of the track or traffic. A timekeeper and a repairman are

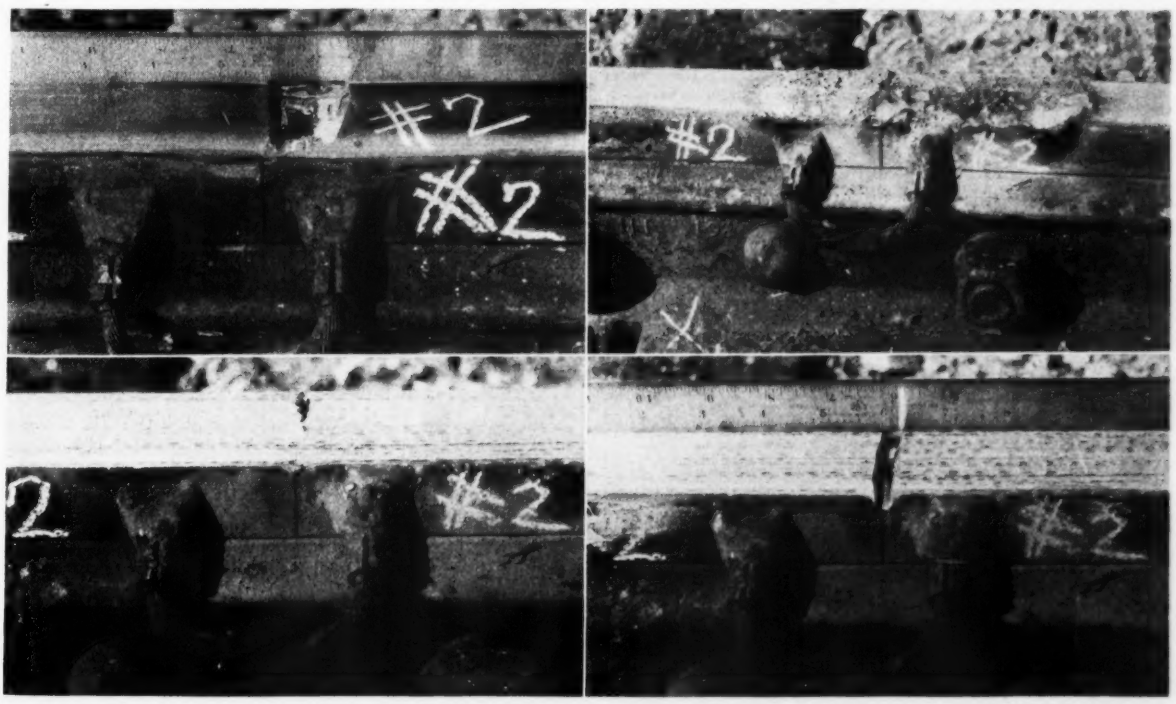


The Two Grinding Operations. Left—Finishing the Top. Below—Forming the Chamfer

Setting the Power Plant Off the Track



An Example of Battered Joint



Views of a Joint After Four Successive Stages in the Welding Operation—Defective Metal Chipped Off—New Metal in Place—Ground to a True Surface—Rail Ends Chamfered

also assigned to each gang. Three shifts of eight hours each are worked by each unit, thus keeping the machines in constant operation.

The joints to be welded are indicated by the roadmaster or his representative, after which the welding foreman marks the length of weld, using an 18-in. straight edge for this purpose. After welding and grinding, the finished joint is again inspected by the foreman and any joints which show any space under the straight edge or any other defects are rewelded, the number of cases where rewelds are necessary being small.

The average length of 10,000 consecutive joints recently welded was 11.5 in. The range in length of the welds is shown in the following tabulation:

Length in inches	No. of joints	Length in inches	No. of joints	Length in inches	No. of joints
4	25	11	886	18	279
5	396	12	972	19	88
6	450	13	1,180	20	56
7	655	14	910	21	22
8	705	15	755	22	14
9	876	16	504		
10	884	17	343		

All of the joints were ground to the true section of the rail and left in as good condition as when new.

The company has been welding joints by this process since July, 1924, during which time it has restored 148,620 joints. The durability is shown by views of the work done during 1924.

The following advantages are claimed for this process:

1. The welding heat is localized and there is no softening of the rail ends. The angle bars, bolts, insulated joints and welded signal bonds are not disturbed.

2. Long defects may be corrected because the heat is confined to the extreme upper surface of the rail.

3. There is no chipping or spalling of the added metal, since fusion is effected through the overstrained fibers of the battered joint and the new metal is bonded securely to the normal metal of the rail below the flaked surface.

4. The full section of the rail is restored for the length of the angle bar by surface grinding with an accurate grinding machine.

5. Compression fractures are prevented by cross-grinding the end of the joint.

6. The flow of metal at the ends of the rail is reduced to a minimum through the special composition of the material used in the process.

7. The cost per unit of area welded is less than heretofore.

8. Responsibility is fixed in the contractor and all work is subject to inspection and acceptance.

The process has also been used successfully in the building up of manganese crossings and frogs, as has been demonstrated by the additional service secured from approximately 200 manganese crossings repaired by this process during the past three years.

To date the company has built up rail ends with this process on the Western Pacific, the Southern Pacific, the Denver & Rio Grande Western, the Union Pacific, the Los Angeles & Salt Lake, the Bingham and Garfield and the Utah Light & Traction Co.

Renewing Turnouts in One of America's Great Terminal Yards*

By A. B. HILLMAN
Assistant Trainmaster, Belt Railway of Chicago, Clearing†

WHEN renewing turnouts in a ladder in a yard where the only access to the tracks is through the ladder, the greater part of the work must, of necessity, be done under traffic or during periods when there is a lull in switching operations. In yards where there is an independent lead parallel to the ladder track, with crossovers every four or five switches, the tracks between any two crossovers can be taken out of service while the work of renewing is being carried out. Even taking four or five tracks out of service, however, greatly handicaps the yard forces and slows up operation. For this reason, even when work is not done under traffic, it must be done as quickly as possible in order to restore the tracks to service, and reduce the interference with yard operations to a minimum.

Increased traffic, larger power and heavier equipment have made it imperative, in many instances, to use heavier rail and therefore heavier incidental materials as renewals become necessary. This is another factor which tends to make this type of work difficult.

The renewal of a lead does not consist merely in unloading the material from a work train and then waiting for an opportunity to install it. There is much preliminary work that can be done that greatly facilitates the actual relaying of the switches. Time is an all-important factor in this work, and the more preparatory work that can be done the less will be the time required for the actual renewal and the job will be handled more smoothly.

Preparatory work includes the bending of stock rails and drilling them for heel castings where these castings are of a type that bolt through the stock rail. If, instead of double bends on the straight side stock rail, welded housings are used, this work can also be done beforehand. The cutting and drilling of closure rails and other short rails can be done in advance. Where standard length rails are used in conjunction with rails that must be cut, the standard rail should be designated for use in certain places and the exact length measured. Allowance should then be made for variations in length when cutting adjacent rails.

If all rails are numbered or given identifying marks it saves a great deal of looking around for the right piece when the actual work is in progress. The work can be done with less confusion and less effort if the rails and all of the fittings are unloaded directly at the point of use. This avoids cross movements and the lost motion which results in shifting material while the work is under way. Care should be used in making measurements for cutting rails, as, other-

*A paper presented before the Maintenance of Way Club of Chicago.
†Mr. Hillman was formerly roadmaster of the Belt Railway of Chicago.

wise, any error made in a switch may be carried down through the length of the ladder beyond. It is also advisable to check up on the location of the frogs, making allowances for any shifting that may have taken place, especially where crossovers are concerned. It may be desirable to have the entire ladder staked out with a transit and the location of frogs and switch points indicated as a preliminary to the work of renewal. This is not always necessary, but in many cases busy ladders which carry a heavy switching traffic become so badly out of line that it is difficult to restore them otherwise.

When guard rails of the bolted type are used the holes in the rail should be drilled in advance. Then as long as the holes are drilled additional time can be saved by also placing the guard rail on the running rail. Waiting until the frog is set and then drilling for the guard rail consumes much additional time and often results in considerable delay in restoring the track to service. Avoid these delays by advance drilling. Where leads require the use of insulated joints these can also be placed on the rails beforehand, as it requires much longer to install this type of joint than the ordinary angle bars.

Above—The Ties Are Usually Spaced During Renewal. Upper Right—Welding Switch Point Housing at a Central Yard. Lower Right—Completing a Switch Laid with Heavier Material

Preliminary Work on the Ground

When steel of heavier section is used in the renewals it is often necessary to respace the ties under the switch points or under the frogs, either because of a difference in the length of the leads or because of improvements in the design of the new materials. When such work is necessary the digging out to the bottom of the ties can be done in advance so that they can be readily shifted into the proper location when renewal is made. Where ties are spaced at the time the new switch is installed and not left until a later date, the plates fit properly and a better job results. There may be times, however, when it is not advisable to shift the ties at the time of laying the switches, especially if the work is being carried out under traffic, but whenever possible ties should be spaced when making renewals.

Switch plates and guard rail plates should be placed in order between the ties so that no time will be lost in sorting the plates when they are needed to place on the ties. Tie plates, bolts, angle bars, spikes, in fact all small materials, can be distributed beforehand. In a well organized gang one man, or occasionally two, is made responsible for this part of the work.

All materials should be placed as closely as possible to the position they will occupy in the track. Care should be taken, however, as a safety measure to keep material away from hand-thrown switch stands. When laying a lead there will generally be trains switching or passing on adjacent tracks, putting the men in a pocket. Delays can be avoided by placing material where it will not be necessary to cross live tracks while handling it.

Another item which possibly should be given first consideration and which greatly aids in the carrying out of the work is a clean lead. Naturally if this is to be done at all it must be done before the actual work of renewal is started, and should be done, if possible, before the new material is unloaded.

All work that has been mentioned as preliminary can be done with a much smaller force of men than is required when the actual renewals are made. Switch work is generally so confined that a large force cannot be used to advantage and much confusion is avoided when all possible work is done in advance.

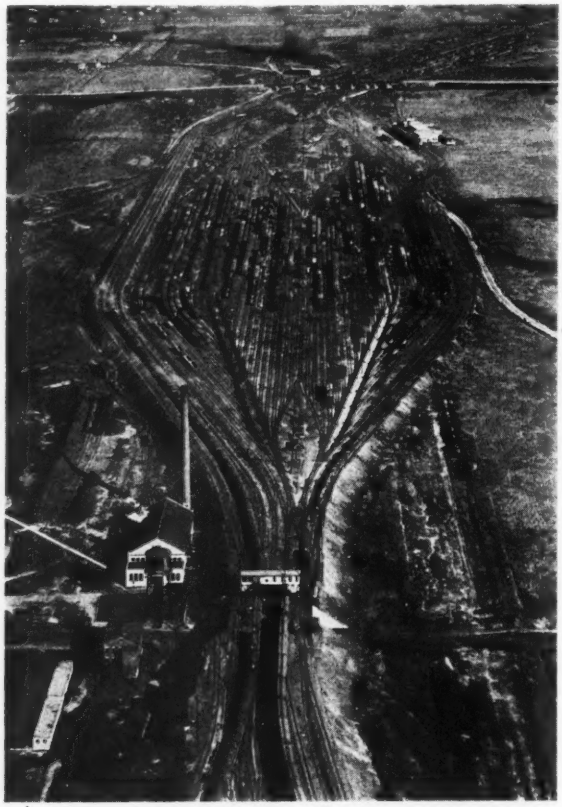
When the Switch Is Torn Out

In making the renewals when traffic has been diverted from the tracks under repair, one side of the ladder should be taken up for the entire length of the work outlined for the day. The old material can then be used as a base from which to gauge and line. In some instances the line on the old lead is so irregular as a result of frequent derailments that it is better to ignore the old material entirely, spike lining one rail of the new work. This method, however, requires a good eye, unless the lead is staked out in advance, and consumes more time. When the alinement of the old lead can be improved it is better to do so in advance, especially where heavier material is used in the replacement. In this way

considerable lining of the new work which would result from irregularities in the old lead is avoided.

It is convenient to have short lengths of drilled rail on hand to place ahead of the new rail when making closures, thereby affording protection to the rail ends until the work is again resumed.

A ladder or series of turnouts must be renewed in as short a time as possible. When the method which has been outlined is followed the time required in making the actual renewals and the length of time tracks are out of service is reduced to a minimum.



Airplane View of a Part of Clearing Yard

How This Work Was Done at Clearing

Clearing Yard of the Belt Railway, which probably receives heavier switching than any yard in this part of the country, has been in service for 11 years. In the construction of the yard 80-lb. material was used in the ladders and in some cases 75-lb. material was installed. Last year it was thought advisable to replace all leads with 100-lb. material as renewals became necessary. It is in carrying out this program, which will extend over several years, that we have put into practice the methods described.

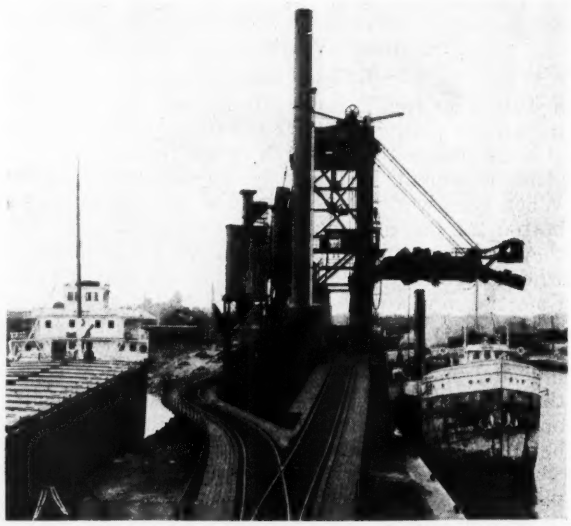
All of the ladders in the yard have independent leads so that it is unnecessary to work under traffic. In the yards where flat switching is done, from 3 to 5 tracks were taken out of service at one time. In some cases as high as eight tracks were abandoned at the start of the day's work and returned to service one by one as quickly as possible. On the hump where switches are thrown from the tower, it was necessary to take half of the classification yard on one side of the hump out of service or 27 out of 55 tracks. It can readily be understood that here the work had to be executed with as little delay as possible.

At the beginning of this work last year some of the foremen opposed much preliminary work. The writer also had doubts as to the advisability of doing too much in advance. It was his thought that errors would creep in that would require a longer time to complete the work than if everything was left until the time of renewal and done on the ground. We soon discovered that even with a little preliminary work the job went along much smoother and required less time and with each undertaking we found more and more that could be done in advance.

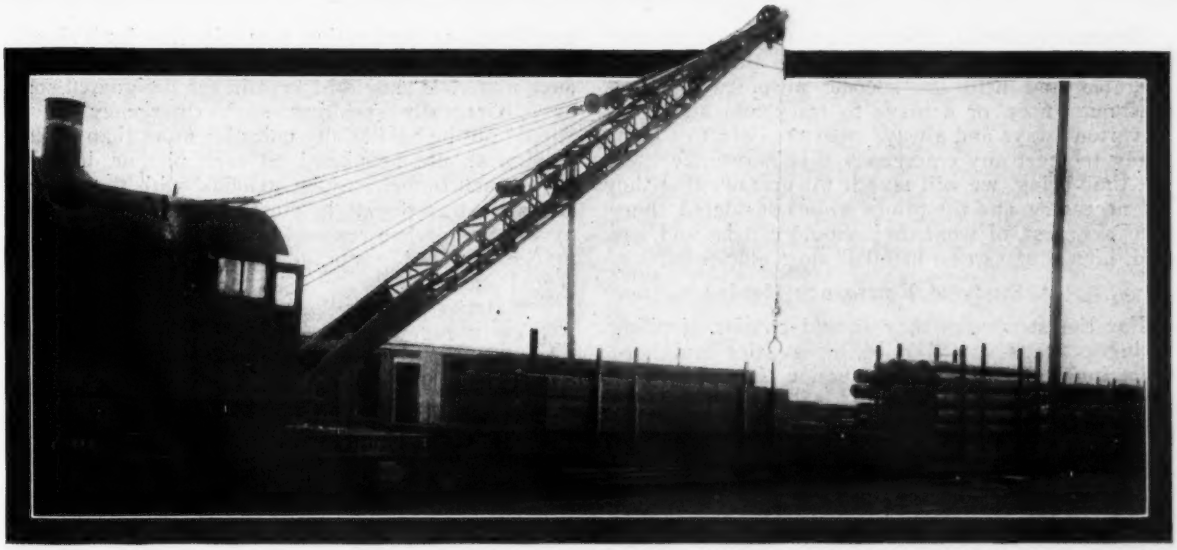
Little Mechanical Equpiment Was Available

We have no mechanical equipment for use in this class of work except locomotive cranes. These cannot be used to advantage for the reason that they have to operate over the lead that is being renewed and the space required for swinging is so great that to do so would obstruct other tracks which are used for switching purposes. Locomotive cranes are used, however, to unload the new material and to load out the scrap and other material relieved during the work of renewal. On the hump 32 switches and 2 diamond crossings have been changed out. In this work we had the use of air for drilling purposes, but aside from the use of the locomotive crane, as explained, this is the only mechanical aid we have been able to secure for the work on the ground. As explained, however, we use air tools and welding equipment at the central material yard where the preparatory work is handled.

So far this year we have renewed a total of 70 turnouts in various yards, a few of which have been done under traffic. Last year our program was not quite so heavy. It is difficult to give cost data for this work, as local conditions enter into each separate job and under certain conditions the cost may fluctuate between rather wide limits. In many instances also the cost of the actual renewal is a small part of the total cost to the railroad for the interruptions to traffic in a busy yard may represent a greater expense than merely the cost of renewing the switches.



Car Dumper at Dock No. 1 of the Pennsylvania at Sandusky, Ohio



A Central Store is Usually Equipped to Meet Emergencies Promptly

How Material Stocks May Be Controlled*

This Is as Much a Problem for the Using Organization As It Is for the Supply Department

By U. K. HALL
General Supervisor of Stores, Union Pacific System, Omaha, Neb.

YOU MEN are charged with the upkeep and maintenance of structures incidental to the successful operation of our arteries of traffic and we all realize that nothing must interfere with this objective. To you, with your multiplicity of duties, the question of materials and supplies may be a side issue—a means unto an end. You are interested in having materials on hand at all times to meet any and all requirements. Otherwise expressed, to you material is incidental only to service.

To us of the stores department, however, the procuring, storing, handling and care of materials is the aim and object of our existence, and is, therefore, an ever-present and most important subject, rather than a side issue. We are free to confess that the stores department alone is not justified in its existence. It is organized, officered and maintained as an adjunct to the using departments—a department of service—and only as we perform this service in having materials on hand in sufficient quantities and at the points needed, with a minimum investment, are we justified in continuing our existence as an organization.

We have this difference from you, however: Whereas you are interested in having the necessary materials when and where needed, we have this same responsibility, but are further charged by our managements with a due regard for the amount of our stock investments. In years gone by this important phase of the subject was not given much consideration. But today, as never before, the managements of our railroads are keeping a weather-eye on this investment item. Therefore, you look at this subject from your viewpoint of service requirements and we from our viewpoint of service requirements plus the value of stock investments; so from these two viewpoints let us endeavor to see if we cannot reach common ground. In considering departmental viewpoints, however, we must all realize that there is a still bigger and even more important viewpoint than that of any department—namely, the interests of the great third party, or the companies that employ us and still farther back of that, the interests of the public which the railroads serve.

The Cost of Carrying Material

As an item of major importance, I would like to call attention to the cost of carrying materials. The general consensus is that it is costing anywhere from 15 to 20 per cent of the investment in material and supplies to carry stocks. This carrying charge covers interest on the investment, handling costs, obsolescence, deterioration, accounting, taxes, insurance, stores facilities, wastage, depreciation, etc. It is a feature that can not and should not be overlooked and must eventually be taken into consideration.

As service is your acknowledged foundation, may we not have the privilege of giving service, plus the cost of investment, as our foundation? This is of particular importance in considering the question of emergency stocks, differentiating these from stocks kept for constant use. Such emergency stocks, until they are put in actual service, are valueless except as insurance. Therefore, being a tied-up investment, the cost of carrying them is of major importance and should enter into all considerations by maintenance forces because of this fact.

*Abstract from an address presented before the convention of the American Railway Bridge and Building Association at Minneapolis, Minn., on October 18.

Emergency stocks, differentiated from maintenance stocks, are placed at strategic points along the lines operated and held for specific purposes, such as washouts, fires, or damage to track and structures in various ways and always with the object of being ready to meet any emergency that may arise. For the time being, we will take it for granted that they are necessary, and the things to be considered, therefore, are, first, of what they should consist and, second, how they can be handled most efficiently.

A Study of Emergency Needs

For the structures they should consist of piling, stringers, caps, guard rails, bridge ties and hardware incidental to the construction thereof. Under no circumstances should such stocks be placed without careful research and investigation as to the quantities necessary. Let us consider that such stocks are placed at junction "A." Proceeding from this junction are branch lines on which are a number of wooden structures subject to floods, tempests or dangers of conflagration. Strict attention should therefore be given to the possible number of structures that might be affected by any sudden emergency. For instance, if certain bridges cross the same dry channel, a cloud-burst might affect a number of them. Therefore the quantity of material to be stored should be predicated upon the number of structures that are liable to be affected. The first necessity, therefore, is close co-operation between the using and the stores departments in arriving at a definite conclusion as to the bill of material to be kept at junction "A." Realizing that materials cost money and that an over-supply is useless, possible requirements should be estimated upon the best basis obtainable.

Can there be any better basis than a bill of material drawn up covering the quantities necessary for a given number of spans? This detail bill of material in proper form should be placed in the hands of all interested in both the using and stores departments and the quantities and kinds so designated should be kept at the maximum stated at the given storage point at all times.

Guard Against Deterioration

We must not overlook the fact, however, that even though the materials must be kept at this junction, there are certain ways of handling that promote efficient railroading. After such a definite bill of material has been agreed upon, it should further be realized that such material is subject to waste and deterioration in the field if not properly stored and piled. Orderly piling and good housekeeping promote efficiency and conserve stocks. Therefore proper skids and platforms should be provided to permit of these materials being placed according to recognized modern practice, or in such a way as to be properly stripped and piled, thus not only protecting the material as far as possible against deterioration by allowing proper circulation but permitting a ready count or view of what is actually on hand at all times. After the materials are so placed it is up to the stores department to see that the stock is maintained at the maximum agreed upon and this can only be accomplished by the using department reporting promptly to the stores department any material used so that immediate replacement can be made.

In consideration of the fact that forest products kept for an indefinite length of time are subject to considerable deterioration, a definite time limit should be agreed upon between the two departments that such materials should be kept in the designated storage. Generally speaking, such emergency stocks should not be held at any point for more than a year. A sign should be placed on each pile or, in some cases, each timber may be stenciled with the date on which it was placed in storage and with the date agreed upon when renewal should be made. For instance, if placed in storage October 1, 1927, this sign would show:

Material placed.....October 1, 1927
To be renewed.....September 30, 1928

Thus any supervisor from any department interested can see at a glance whether the terms of the agreement have been followed out. We all realize that there is often more stress and strain on temporary structures thrown together in time of emergency than in properly built permanent structures; therefore if the materials are not up to standard there is the possibility of damage when placed in emergency use. By renewal at the agreed time, the old materials can be put into general use before deterioration sets in and new materials put in as replacement, the maintenance department being thus assured of material ready and suitable for use at any time of emergency requirement.

How Soon Can the Material Be Used?

For the sake of argument and in consideration of the 15 to 20 per cent carrying charge let us consider whether or not we have followed the line of least resistance and have placed stocks at points where they are really not justified by the demands of the service. In case of an emergency, it is of little value to have materials available where forces and equipment for rebuilding are not at hand. Thus, the first things to be considered in placing such stocks are the facts as to how long it will take to obtain forces and equipment to use the materials required. If it is necessary to send to a distant point for pile drivers and forces, little is gained by the indiscriminate piling up of materials when they could be brought along with the equipment and forces coming to the scene of trouble. In consideration of the non-movement character of emergency stocks, we all should endeavor to hold the number down to the minimum, thus decreasing the cost of investment and still meeting the needs of the service.

The solution of the problem of emergency bridge stocks depends largely upon the question of co-operation between the using and the stores departments. An incident connected with an extensive washout on a certain road has come to my attention recently. This washout was far in excess of anything that could possibly have been anticipated. Although at the time it could not be ascertained to what extent materials would be needed, the stores department of this road, upon learning of the trouble, immediately loaded and had en route or under load, 75 carloads of bridge materials, including piling and all necessary timbers, hardware, etc. Although the requirements were far beyond any expectation, the materials arrived in sufficient time to meet the needs, due to the active co-operation between the bridge and building department and the stores department. Here we find an instance where the situation was handled to the satisfaction of all without relying on emergency stocks.

If an examination should be made as to the value of materials carried in the so-called emergency

stocks, I am sure it would be nothing unusual to find that it would run anywhere from $1,000 to $10,000 at each point. Therefore, taking into consideration that it is costing our companies from 15 to 20 per cent on non-productive investment to carry these stocks, this value is a most important item.

One Way to Provide Emergency Stocks

An instance can be cited where this situation has been solved by what we consider a very efficient and economical arrangement. At junction "B" such a stock had been maintained, also other stocks were carried on the main line east and north of this junction point. The maintenance department, in conjunction with the stores department, after giving consideration to the subject, abolished all of these stocks, several in number, and in lieu thereof, secured out-of-service or non-revenue flat cars on which are kept a quantity of piling, bridge timbers, hardware, etc., as agreed upon, subject to designated renewals to prevent deterioration. These cars, being under load, are similar to a fire department—ready for a call at any time—and thus the investment has been reduced several fold, while every requirement of the service has been met. One can see at a glance the extent of the material investment that can be reduced under such an arrangement, without any lessening of service, and with a saving in the 15 to 20 per cent carrying cost.

Unnecessary Stocks

There are a number of instances where the so-called emergency stock privilege is abused. One case has come to our attention at a terminal point where a large material yard is in existence, sufficient to supply all the operating and maintenance needs of an entire division. In this same terminal, at a point less than a mile from the main stock, there was established a so-called emergency stock, thus duplicating stock investment. In this instance, by definite analysis, it could be proved that these stocks were not for emergency, but had been placed for easy access to avoid the necessity of calling upon the main supply when needed. If the maintenance and the stores departments are sufficiently alive to the necessities and up on their toes at all times there is no justification for such a stock, as an emergency call at any time, day or night, would permit the loading of supplies from the main material yard, to meet any possible requirement, far above the quantities that would be justified in any emergency stock.

We are not advocating any lessening of protection to keep the line open for traffic, but rather we are endeavoring to co-operate with the using department to meet all the necessities of the service and at the same time reduce to the most consistent level the cost of investment and the 15 or 20 per cent carrying charge incidental thereto. What we do urge is a further definite study as to where such stocks are placed, as to whether or not they are actually necessary or if a consolidation or a lessening of such stocks without interfering with the protection required, could be arrived at.

Slovenly Methods Lead to Excessive Stocks

Materials Carried by Bridge Outfits

Nothing has been said with reference to the stocks that are carried in bridge and building outfits, which are being constantly carried up and down the line. These stocks are for both emergency and maintenance purposes; nevertheless investigation in many cases will reveal the fact that there is an excess investment and that more materials are so carried than are essential to the service. Such excess stocks are detrimental to the users as well as to the interests of the company.

An instance has come to our attention where a foreman, with the co-operation and assistance of the store department, instituted the use of stock books, to list the items carried in these outfits. Once a month stock is taken of what is on hand and replacement is made on the basis of actual use rather than guesswork. The foreman, at first said that this could not be done and would require additional clerical force, but after using the system for a year, stated that he could not operate efficiently without it and even if not instructed, he would keep a definite record of the movement of such stocks on his own volition. He has the satisfaction of knowing at all times just what he has on hand, in what quantities the material is moving, and for what purpose all his items are carried. Such a system, which at first glance might seem elaborate, is fully justified by the results ob-

tained. Let us here also bear in mind the 15 to 20 per cent carrying cost.

Another subject, which in a way does not involve as much in dollars and cents, but which is more difficult to control, is the question of water service materials. The same fundamental principles are involved here, namely, that nothing must be done that will in any way jeopardize the necessities of this department in actual operation. Following the line of least resistance, however, we find an excess line of so-called protection materials at many pumping plants and junction points. Investigation of these stocks on well-organized roads that have already given considerable thought and study through the using and stores departments, has developed the fact that the value of materials and supplies kept at such points will easily average at least $1,000. When the number of points so protected is multiplied with a given value on any one road, it can easily be seen what vast sums are represented in this material investment. This subject should also be one of close study and co-operation between the using and the stores departments, and the same line of procedure, a definite bill of material for each point, should be agreed upon.

Watch Emergency Stocks for Water Service

Such emergency supplies should consist of replacement parts of special nature hard to obtain and should not include fittings incidental to general upkeep. The over-supplying of such common stocks is a misuse of the privilege and reflects mismanagement in not ordering from the usual source of supply the general items necessary for maintenance and upkeep. The emergency stocks should be confined to actual protective necessities and placed upon a definite and effective basis of the minimum materials necessary to meet maximum service.

This thought applies, possibly to an even greater extent, to materials maintained at coal chutes where the average cost of materal tied up at each chute will easily aggregate $2,000 to $3,000. The same *modus operandi* should be followed, namely, a definite bill of material arrived at through co-operation with the using and the stores departments, and blueprints or lists kept in the files of both departments ready for instant reference. Everyone realizes the importance of continuous operation of coal chutes and nothing would be advocated by an intelligent railroad man that would jeopardize such operation. However, considering the 15 to 20 per cent cost of carrying materials and the generally accepted advantage of decreased material investment, endeavor should be made through co-operation with the using and stores departments to center ample protective material for coal chutes at a logical point.

Certain Parts Must Be Held Locally

We all realize that there are certain parts, such as gears, fly wheels, and parts subject to sudden strain or absolutely essential to the operation of the plant, which should undoubtedly be kept on hand at the local point. There are other items held locally, however, which could be centered at a given point and the entire supply for a division consolidated, thus greatly lessening the amount necessary for protective purposes.

In considering so-called emergency stocks for water service and coal chutes, consideration should be given to the train service at the points in question. It has been found by experience that many dollars worth of materials once scattered and considered as essential for emergencies, have been consolidated in general or division stores by the use of the definite bill of materials mentioned and taking into consideration the train service. If the service is such that shipments can be made at almost any time of the day or night there is a great lessening of tension, thus making it possible to reduce greatly the local materials carried.

Further, if the stores department at a given point of general supply has secured, through the co-operation of the using department, blueprints showing the requirements of the various pumping plants, coal chutes, etc., listing the character of the engines, pump, gears, and general requirements, it is in a position on a moment's notice to make replacements and also through such knowledge can often make substitutions sufficient for immediate needs.

Briefly summarized, my plea is for the realization of the importance of this subject, emphasizing both service requirements and the cost of carrying materials, with the subsequent savings to our companies by any reduction in the value of materials carried. With this realization, may we not apply that spirit of sympathetic co-operation to all branches of the service, in the endeavor to foster to the utmost, the interests of the company that employs us? May we not eliminate any haphazard stocking of materials and through a definite plan place the minimum materials necessary at strategic points to meet all maximum service requirements, see that they are properly cared for and in every way within our power measure up to our responsibilities to our companies?

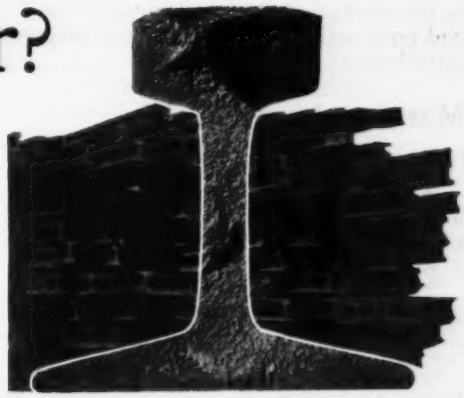
Discussion

The discussion of this paper indicated the growing realization on the part of maintenance men of their responsibility for excessive stocks of materials. M. F. Clements (N. P.) stated that as a result of recent conferences with the general storekeeper on that road plans are now being developed to reduce the stocks of emergency materials held for washouts and burnouts, while W. F. Koehn (C. P. R.) stated that emergency stocks have been cut to one-fifth of their former quantity on that road. W. T. Krausch (C. B. & Q.) cited the problem that arises in carrying repair parts for coaling and water station equipment which it is essential to keep in continuous service, stating that when buying this equipment, it is his practice to give special consideration to those manufacturers which carry protective stocks at convenient locations.

Material in the Making—A Tie Hacker at Work

What's the Answer?

What Our Readers Have to Say on Current Questions That Perplex Those Engaged in Maintaining Tracks, Structures and Water Supply Facilities



QUESTIONS TO BE ANSWERED IN THE FEBRUARY ISSUE

1. *What special precautions should be taken in the maintenance of main tracks during alternate periods of freezing and thawing?*

2. *When a trestle bridge is renewed by driving new bents, how close to the ground should the piles in the old bents be cut off?*

3. *What, if any, advantages are gained by using guard rails which extend above the top of the running rail on sharp turnouts? What should be their maximum height above the running rail?*

4. *Is it worth while to install flue linings in the chimneys of stations and other railway buildings where they are not required by ordinance?*

5. *How do Mexicans compare with other classes of track labor? Do they possess the qualities to fit them for skilled work, or as foremen?*

6. *What water service maintenance or betterment work can be done advantageously in the winter?*

7. *Where snow conditions are bad, is it worth while to flatten the slopes of shallow cuts and to widen the deeper cuts with steam shovels to prevent their becoming blocked by snow?*

8. *Should the maintenance of water barrels on bridges be looked after by the track forces or the bridge forces?*

Preliminary Work for Winter Rail Laying

When new rail is to be laid in the winter, what preliminary work should be done before freezing weather begins?

Track Should Be Put in Good Condition and Preliminary Adzing Done

By A. C. KNIGHT
General Foreman, Delaware & Hudson, Schenectady, N. Y.

Laying new rail during the winter months means economy for the maintenance of way department. The location where the new rail is to be laid should be determined at least six months in advance in order to allow the section foreman to place the track in proper condition before the ground freezes, as the amount of work to be done may require the use of an extra gang. If necessary the track must be lined and raised to protect the expansion and to reduce the amount of shimming necessary under the new rail. The track should be fully tie plated previous to laying the new rail, but if this cannot be done great care must be taken if both operations are performed at the same time. The adzing should be done by experienced trackmen during December if the rail is to be laid in January. The shimming and spiking should also be done by experienced men in order to provide a uniform bearing for the new rail.

If the rail to be removed is badly worn, much shimming can be done under the old rail, especially at the joints; this will enable the gang to move ahead faster with the new rail. Rail anchors should be applied to the new rail as it is laid to keep the expansion uniform.

As soon as the frost is out of the ground in the spring the shims should be taken out, the ties tamped and the bolts tightened. If the track is put in good condition before the ground freezes there will be no undue wear on the rail.

Preliminary Work of Various Kinds Will Expendite Rail Laying in Winter

By R. ROSSI

The preliminary work to be done before freezing weather begins when rail is to be laid in winter should include surfacing and gaging, and the removal of all ballast from the tops of the ties, and to a depth of from 1½ to 2 in. below that level. The ballast should also be cleaned away from around the anti-creepers. All adzing that can be done in advance of the removal of the rail should be carried on before freezing weather begins and the bolts should be oiled so that they may be removed readily when the rail is taken out.

If the rail and other track materials are received in the fall the rail should be unloaded along the track in such a way that dirt or cinders will not freeze to the base or head and the other materials should be unloaded and stored near the section tool houses.

By making these preparations before the track is frozen, as good progress can be made in relaying rail in winter as in summer. I have been engaged

in this kind of work for many years and have always had good results when the proper preparations were attended to.

Marking Locations of Cross Drains in Cuts

Where tile drains are laid in cuts, with cross drains under the tracks, is it worth while to mark the location of the cross drains and, if so, how should this be done?

Should be Marked on Diagrams and Section Foreman Furnished with Copies

By J. B. Oatman

Roadmaster, Buffalo, Rochester & Pittsburgh, Du Bois, Pa.

The location of drain tile and cross drains under tracks is of such importance that all tile and cross drains should be accurately located preferably between mile posts and blueprint diagrams should be kept of all locations where such drains are placed. Small diagrams covering each section should be furnished the foreman and larger diagrams covering roadmaster's or supervisor's districts should be in their offices. The object of the blueprint diagram is, in the event that roadmasters, supervisors or foremen are changed, to insure that the new men will have available records showing where tile has been placed. If no accurate record is kept of tile locations, it is a matter of guess work in many cases as to whether tile has been placed in certain cuts or not and to determine this requires a large amount of work, especially the cross drains. Where a location record is kept it is an easy matter to determine where all tile and cross drains are located by referring to the diagram.

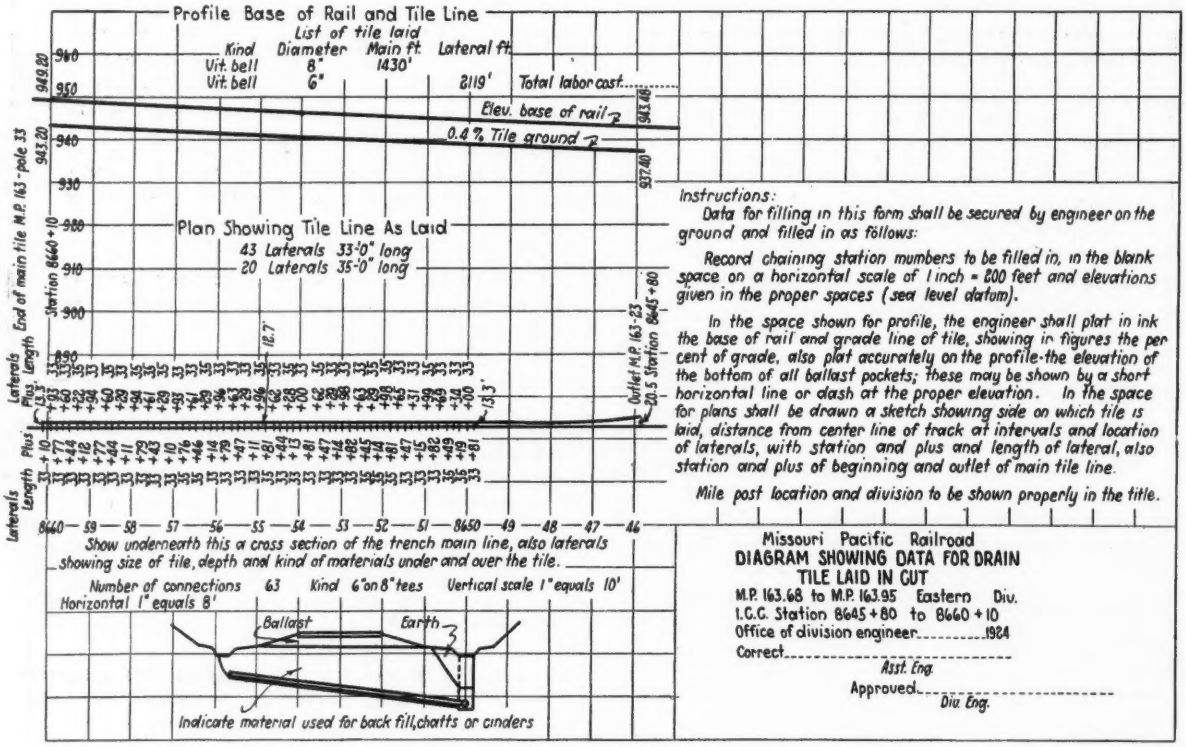
Maps Should Be Kept on File Showing Location of All Tile Lines

By A. A. Miller

Engineer Maintenance of Way, Missouri Pacific, St. Louis, Mo.

The accompanying plat shows the manner in which the final record of roadbed tile drains is preserved on the Missouri Pacific. It will be noted that the entire system is tied into the I. C. C. stationing, which includes the inlets and outlets of lateral connections. In some cases where the cut does not indicate the present necessity of laterals we lay tees in the main drain with vitrified clay stoppers in the branch connections in order that the main drain will not have to be broken if we should find it necessary to increase the number of laterals at some time in the future.

It is, of course, essential that the location of these tees be known so that if water pockets should develop the laterals can be installed without extensive digging to uncover the tee. We feel that giving the station and plus supplies the proper information.



How the Record of Tile Drains Is Preserved on the Missouri Pacific

Cast Iron Pipe for Suction Lines

Under what circumstances, if any, is cast iron pipe preferable to wrought iron for suction lines?

Cast Iron Pipe Has a Much Longer Life in Certain Soils

By J. R. Hickox

Hydraulic Engineer, Chicago, Burlington & Quincy, Chicago

The question as to the relative merits of cast iron or wrought iron for suction lines can best be answered by giving the reasons for and against the different kinds of pipe.

The considerations in favor of cast iron pipe are as follows:

1. For sizes larger than four inches it is cheaper than genuine wrought iron pipe and for sizes larger than six inches it is cheaper than wrought steel; 2. When laid in cinders or in ground that has a high sulphur or alkali content, it has a much longer life than either wrought iron or wrought steel.

The advantages in favor of wrought iron or wrought steel pipe may be summarized as follows: 1. It can be laid cheaper than cast iron pipe, due to the difference in the cost of making the joints; 2. The joints can be made above ground and the jointed pipe lowered into place where the trench contains soft mud or water; 3. The threaded joints on wrought pipe are not as apt to leak as the joints of cast iron pipe; 4. If the end of the pipe extends into the stream where it may be somewhat disturbed by floods or ice, the sections of wrought pipe are not as apt to become detached as are those of cast iron, both on account of the nature of the joints and the length of the section of pipe.

Cast Iron Is Preferable In Some Cases

By Division Engineer

While wrought pipe is usually to be preferred for suction lines there are times when the use of cast iron pipe will effect large savings, especially when the pipe is to be laid where the soil contains corrosive elements. Much of the opposition to cast iron for suction lines is due to the leakage of air at the joints but if the joints are carefully made this objection can be overcome.

The writer knows of a case where a cast iron discharge line through a swamp was changed into a suction line by moving the pump house from near the source of supply to a point near the track to reduce the cost of handling fuel. This line functioned satisfactorily for suction and there was no air leakage at the joints, due to the fact that the pipe was submerged. In this case the ability to use the cast iron pipe line for suction made possible marked economies in the operation of the plant.

The choice of material for suction lines resolves itself into the question of comparative costs, in which the cost of the pipe itself, the cost of making tight joints, the cost of laying the pipe and the service life of the pipe are factors which must be considered.

Uniform Expansion at Rail Joints in Cold Weather

Is uniform expansion at the rail joints in cold weather of any importance and if so, what measures can be taken to insure it?

Uniform Expansion in Winter Can Be Secured With a Little Care in Laying Rail

By J. A. S. Redfield

Assistant Engineer of Maintenance, Chicago & North Western, Chicago

The provision of uniform expansion when laying rail during cold weather is just as important as in summer; in fact it may be even more so. The measures which can be taken to insure uniform expansion in rail laid in the winter are the same as at any other time, namely, the use of the proper expansion shims in accordance with the temperature and butting the rail hard against the shim as it is set in. The shims should be left in place until the rail laying has proceeded far enough so that the butting of the rail will not disturb the expansion between rails already laid after the shims have been taken out.

The maintenance of reasonably uniform expansion in existing track is not as important during the winter as in the summer. There is no danger of the track kicking out in cold weather but there is a possibility of shearing the bolts when the expansion pulls out to its extreme limit. Wide expansion openings also cause heavier batter at the joints. The remedy is to redistribute the expansion into adjacent joints by driving the rail. New anglebars and tight bolts will help to hold joints which have a tendency to pull apart, and additional anchors may also be applied to hold the expansion.

Uniform Expansion Is as Important in Cold Weather as in Hot Weather

By E. W. Hammond

Engineer Maintenance of Way, Buffalo, Rochester & Pittsburgh, Rochester, N. Y.

Uniform expansion at the rail joints is of as much importance in cold weather as in hot weather. If the expansion is not uniform in cold weather, excessive stress is thrown on track bolts in joints where the space is wider than normal, resulting in a liability of broken bolts. In addition, unless the expansion is uniform and normal for the temperature, the rail ends will be damaged by battering at joints where the expansion is too wide.

To insure uniform expansion in cold weather as well as in hot weather, expansion shims of the proper size, depending upon the temperature, should be used when rail is laid, and in locations where there is any tendency to creep, a sufficient number of rail anchors should be used to counteract the creeping tendency. These precautions will maintain uniform expansion under all weather conditions, providing the track is kept in good surface and line, and the joints properly tamped on dry, clean ballast.

Brush Treatment for Untreated Piles

Is it worth while to give untreated piles a creosote brush treatment before their use in bridge work? If so, how should the treatment be applied?

They Should Be Brush Treated for Permanent or Semi-Permanent Work

By H. B. Hoyt

Superintendent Timber Preserving Plant, Buffalo, Rochester & Pittsburgh, Bradford, Pa.

The answer to this question depends on the use for which the piles are intended. In the first place, wooden piling for permanent work should by all means be creosote treated by a standard pressure process. For strictly temporary work, such as falsework, which will be in place but a comparatively short itme, it will not pay to give the piles any kind of treatment, even a brush treatment. For semi-permanent or for permanent work where pressure treated piles are not available, a brush treatment is worth while. In this case the entire pile should be brush treated before driving, all bark having been removed before treatment. The brush treatment should be given twice, about 24 hrs. apart, with hot creosote of a character recommended for brush treatment.

In using either pressure-treated or brush treated

piles, all places where the piling is framed or cut should be treated in a similar manner by brush treatment.

A Brush Treatment Is Wasted Effort

By L. H. HARPER
Formerly Superintendent Creosoting Plant, Central of Georgia, Tampa, Fla.

Piles used in bridge work are usually divided into two classes—First: Those which are to serve as part of a permanent structure; Second: Those used in emergencies to carry a span until a permanent bridge can be provided, or as falsework in connection with the erection of a new span. In the first case, only pressure-treated piles or those of such durable nature as not to require treatment should be used, while in the second case only a limited life is usually expected and untreated piles will ordinarily suffice. A brush treatment in the case of a pile will only be wasted. The vulnerable point for decay in a pile is at the ground line, water line, or line of permanent moisture, and I do not believe that enough penetration of creosote can be secured with a brush treatment to be at all effective. If an untreated pile will not do the work, then a pressure-treated one should be used.

Storing Portable Snow Fence

What is the best method of storing portable snow fence so that it may be in proper condition for use when needed? Is there any advantage in leaving this type of fence in place during the summer months where the character and use of the ground permit?

It Should Be Stored on the Right of Way

By G. G. SMART
General Roadmaster, Great Northern, St. Paul, Minn.

As a rule it is not satisfactory to leave portable snow fence panels in place after the frost is out of the ground, as the high winds blow the panels over and do considerable damage. This is due to the ground being soft and stakes not having sufficient holding power. Only in sheltered locations where the fence does not receive the full force of the winds is it permissible to leave it stand throughout the summer.

The fence should be piled on the right of way, standing the panels upright and leaning them together with from 8 to 12 panels in each pile, to avoid carrying the fence too great a distance. Repairs should be made in the fall when the fence is set up.

It Should Not Be Left in Place in the Summer

By A. SALINSKY
Roadmaster, Buffalo, Rochester & Pittsburgh, East Salamanca, N. Y.

Portable snow fence panels should be stored as close to the location where they are to be set up as possible to avoid excessive trucking or carrying The panels should be piled flat in piles of eight panels, each supported on old ties, and two strips should be nailed on each end of the pile to prevent their being blown over by strong winds. The grass and weeds should be cut from the ground in the immediate vicinity of the piles to prevent the possibility of fire.

It is not advisable to leave portable snow fence panels in place during the summer months, even where the character and use of the ground permit for these panels are easily blown over by the wind and are also liable to be damaged by fire during the summer months.

Short Lengths of Lumber for Railroad Buildings

In making bills of material for new buildings or for repairs to existing buildings, to what extent is it practicable to specify short lengths of lumber so that the material may be purchased accordingly?

It Can Be Done to a Certain Extent

By A. T. HAWK
Engineer of Buildings, Chicago, Rock Island & Pacific, Chicago

The use of short lengths of lumber is of economic advantage since lengths less than 16 ft. can be purchased at a lower price. It has not been feasible, however, to put this practice into effect to the full extent due to the inability to forecast accurately the requirements for the year. On this account it is not the practice to purchase other than 16 ft. lengths in the common grades, since to do so will greatly increase the amount of the stocks to be carried.

In finished lumber, on the other hand, such as flooring, ceiling, drop siding and shiplap siding, we have for a long time specified random lengths ranging from 10 to 20 ft. and it is found that this not only saves money in the cost of the material but also eliminates a great deal of waste. Aside from the savings made it is also felt that this practice conserves timber. In this connection, it may be said that we have discontinued the use of 12 in. widths of one-inch and two-inch lumber, thereby making a material reduction in costs due to the higher price demanded for this width and making available for use the much more plentiful widths of 8-in. and 10-in. This change was made a number of years ago and none of our plans or standards now specify 12-in. widths.

Use of Short Lengths Will Reduce Costs

BY TRADE EXTENSION COMMITTEE, CENTRAL DIVISION, NATIONAL LUMBER MANUFACTURERS' ASSOCIATION, CHICAGO

In specifying lumber for construction purposes, it is entirely practicable to list short lengths four, five, six and seven feet long wherever they can be used without loss of strength or excessive waste in trimming. The production of short lengths is unavoidable in lumber manufacture so that there will always be a supply of these lengths available. The present production of lengths less than eight feet long varies from 5 to 10 per cent in accordance with the species, mill practice and marketing methods. These short lengths are shipped either separately or mixed with long lengths in random length shipments.

From 2 to 18 per cent of random length yard lumber shipments contain lengths under 8 feet, as shown by a survey made by the National Lumber Manufacturers' Association. The mill price for selected long lengths of soft wood varied from $2 to $6 higher per thousand feet than for random lengths for select grades and from $1.50 to $3 higher for common grades. The mill price of random long lengths from 10 to 20 ft. was from $5 to $24 higher than for straight shipments of lengths less than eight feet for select grades and from $2 to $12 higher than for common grades.

This means that a very worth while saving is pos-

sible through specifying short lengths where they can be used to advantage. Not the least advantage of using short lengths is that such stock is of higher quality than long lengths in the same grade, such short pieces being very often free of defects for their entire length.

In an investigation recently made by the Central Committee on Lumber Standards, which included a detailed study of 20 frame houses of various designs, 32.7 per cent of the lumber used was found to be less than eight feet long, 10.9 per cent, eight to nine feet inclusive, and 56.4 per cent was over nine feet long. This shows that it is possible to save from 5 to 10 per cent of the price of from 25 to 50 per cent of the lumber used in the average frame building by specifying short lengths.

For further information on short length lumber, the reader is referred to a pamphlet entitled "The Marketing of Short Length Lumber," published by the U. S. Department of Commerce in 1926, and obtainable from the Superintendent of Documents, Washington, D. C., at a price of ten cents.

Precautions to Be Taken When Driving Piles in Frozen Ground

What, if any, precautions should be taken when driving piles in frozen ground?

Holes Should Be Opened Through the Frozen Ground For the Piles

By T. H. Strate

Engineer Track Elevation, Chicago, Milwaukee & St. Paul, Chicago

When driving piles through ground which is frozen to any depth it is necessary to start a hole through the frost where the pile is to be driven to avoid injury to the pile. These holes are usually made with picks and iron bars, although dynamite is sometimes used where the ground is frozen deeply. A steam jet can be used to thaw the ground if a steam supply is available; the thawing has also been done by building fires at the points where the piles are to be driven. This latter method is not very satisfactory as it is a slow process and there is also danger of setting fire to adjoining structures.

Any of these methods adds to the cost of pile driving and for this reason it is our practice to drive piles in frozen ground only when it can not be avoided. In carrying out the program for the renewals of pile trestles, the piles are driven before the beginning of winter, preferably in the fall, so that the new decks may be applied during the winter.

It Depends on the Strength of the Pile and the Depth of the Frost

By Assistant Bridge Engineer

The precautions to be taken when driving piles in frozen ground depend on the strength of the piles and the depth to which the ground is frozen. With heavy piles of sound, dense timber, few precautions are necessary, but if the piles are small and the ground is frozen to a depth of several feet there is danger of breaking the pile, particularly as timber is usually more brittle at temperatures below freezing.

When difficulty is encountered in driving piles in frozen ground, it is sometimes sufficient to use cast iron or wrought iron shoes on the ends of the piles to assist penetration and to avoid brooming the end of the pile. If this will not avail, a steel pointed pile stub is sometimes driven through the frozen ground and then withdrawn, the pile being driven through the opening thus made.

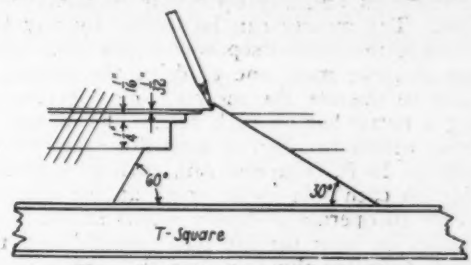
Where the frost is not too deep and where there is plenty of waste wood at hand, it sometimes is possible to build bonfires over the ground where the piles are to be driven to thaw it out. This method, of course, can only be used in certain localities and its use is attended with fire hazards unless great care is taken. If a steam supply is at hand steam jets can be used to thaw the frost.

Ordinarily the driving of heavy piles in frozen ground can be done with no great difficulty, but outfits doing this work in winter should be provided with the necessary equipment so that it may be used if necessary to prevent delay to the work.

A Convenient Lettering Guide

By Joe Brejcha, Jr.

IN LETTERING drawings, it is necessary to draw guide lines so that the letters will be of uniform height. In order to standardize the guide lines I cut a series of steps in a 30-60-deg. triangle, as shown in the illustration. The steps are 1/32, 1/16 and ¼ in. high, respectively, the last named being used for

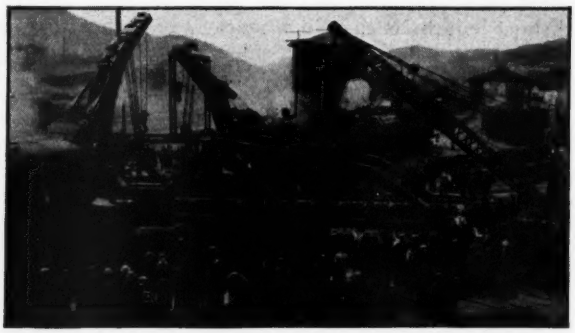


How the Lettering Guide Is Used

titles consisting of capital letters only. In operation, the triangle is slid along the T-square with the pencil placed in the proper step. It will be seen that the guide lines can thus be drawn without previous measurement, and that all the letters on the drawing will be of the same height. The 60-deg. side of the triangle may be used for drawing the guide lines that determine the slope of the letters.

Mulberry Creek Bridge on the Mobile Division of the Southern

New and Improved Devices

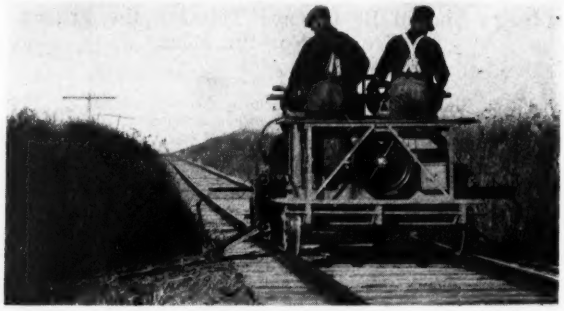


A New Track Mower

A POWER track mower which embodies a number of new features has been developed and placed on the market by Fairmont Railway Motors, Inc., Fairmont, Minn. This machine, which is designated as the Fairmont M24 mower, consists of a four-wheel track car on which are mounted a five-horsepower Fairmont gasoline engine, together with the cutter-bars and the operating mechanism and controls. The mower can be hauled by any track motor car with a six-horsepower engine and requires a crew of three men, one to drive the towing car and two to operate the mower, one operator controlling a cutter-bar on each side. The mower will cut from within two feet of each rail to an extreme distance of 13 ft. from the rail, cutting swaths 5½ ft. wide on each side of the track at one operation. It is said to operate in heavy weeds at the rate of four miles an hour for the inner swaths and three miles an hour for the outer swaths, or an average of 1¾ miles for the entire work.

The cutter-bars are attached to the ends of extension beams which are drawn in or out to the desired position by rack and pinion gears actuated by the operators. They are driven by a belt from the engine through power heads at the ends of the extension beams, so arranged with idler pulleys that the cutter-bars cease their movement when raised from the cutting position, thus permitting the mowing to be stopped on either side while it continues on the other. Cutting begins automatically when the cutter-bars are lowered into the cutting position while the engine is running. The engine on the mower is equipped with a governor to maintain a constant speed of the cutter blades, regardless of the density of the vegetation or whether or not cutting is in progress.

The cutter-bars can be raised or lowered by the operators to follow the contour of the ground closely. While cutting the outer swaths the power heads are extended out to the shoulder of the embankments and the cutter-bars may be dropped downward from this point to an angle of 55 deg. from the horizontal, permitting the cutting of weeds on the slope of the embankment.



Cutting Inner Swath to Within Two Feet of Rail

Provisions have been made for protecting the mower from injury in case hidden obstructions are encountered. The mower is attached to the motor

Cutting Outer Swaths to a Distance of 13 ft. From Rails

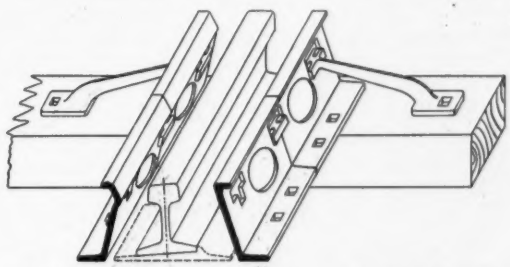
car by an automatic spring coupler and if the cutter-bars strike an obstruction the mower will uncouple from the towing car. Each operator is provided with a pedal brake by which he can stop the mower in the event he sees an obstruction which the driver has not observed. Power lifts, also provided with pedal controls, raise the cutter-bars to a vertical position and also draw in the power heads if it is necessary to pass whistle posts or other signs or objects without stopping the motor car. The power lift is also used for folding back the cutter-bars to a vertical position when mowing is discontinued, a safety chain being hooked around each cutter to hold it in place securely. The belt drive to the power head also serves to prevent injury since in case an obstruction is met which cannot be cut the belt will slip, thus stopping the operation of the cutter-bar.

The mower is provided with a turntable of the screw jack type operated by a hand wheel to permit its ready removal from the track at road crossings or set offs, or to turn the unit for the purpose of cutting the second swaths by running back over the section of track on which the first swaths have been cut.

A New Flangeway Guard

THE LEBANON Steel Foundry, Lebanon, Pa., has recently developed a new type of steel flangeway guard for use in paved streets and at highway grade crossings, which is designed specifically to overcome the disadvantages of a flangeway guard in direct contact with the track rail. This guard, which is manufactured in normalized electric furnace cast steel, is of a modified channel section, and is made up in four-foot lengths which are keyed together to form a guard of any desired length.

The outstanding feature of the Lebanon flangeway



Installation Sketch of Flangeway and Outside Guards with Braces in Supplementary Key Holes Over Tie

guard is the fact that it is installed entirely independent of the track rail and its accessories, and thereby is not seriously affected by the vibration and undulation set up in the rail under load. As the recommendation for its installation provides a three-inch flangeway between the guard and the rail head, ample clearance is afforded for setting track spikes and for the maintenance of rail joint throughout the length of the guard, and in some instances it is possible to change out rail without removing the guard or destroying the pavement.

The guard sections are fastened in place by spikes driven into the ties, spike holes being provided at intervals of six inches along the lower flange of each section for this purpose. Additional anchorage for the guard is provided through the use of special braces, which not only assist in holding the guard in place, but which are also designed to act as keys to hold the separate guard sections together in correct alinement.

The design of the guard provides for varying widths of ties and also for variations in tie spacing, and where a section joint does not fall directly over a tie, permitting the use of a brace, a special interlocking key is provided and the brace is moved a short distance to the right or left to one of the regularly spaced key openings provided in the web of the guard which falls directly over a tie. In this way every joint can be keyed, and at the same time the proper number of braces are afforded to each section.

In addition to the advantages mentioned, the Lebanon guard, being made in sections, is easy to handle, and being fastened in place by spikes, is simple to install.

Lebanon Flangeway Guards Installed in a Bituminous Crossing

Special holes provided in the web at regular intervals insure anchorage of the guard to the pavement, and special 18-in. flange end sections give the guard a finished appearance in a crossing. The guards are made up to suit any height of rail, and outside guards, more or less similar in design to the flangeway guard, can be furnished if desired.

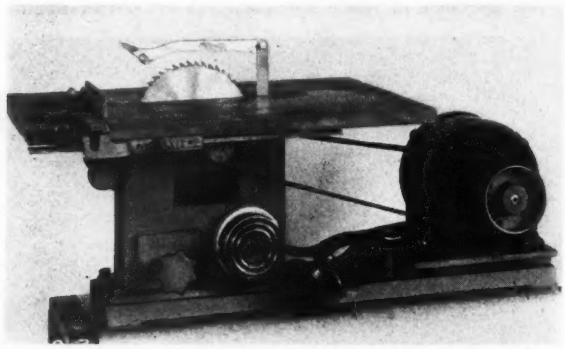
A New Bench Saw for Precision Work

THE AMERICAN Saw Mill Machinery Company, Hackettstown, N. J., has recently put on the market a ball-bearing bench saw designed specifically for a wide range of precision work. This sawing machine, which has a solid cast table, 18 in. by 24 in., is supported on a cast pedestal and bed plate, the total height of the machine being 12¼ in. The sawing table of the machine can be tilted to any angle up to 45 deg., and has a rise and fall of 2¼ in., both of these movements being controlled by hand wheels conveniently located along the side of the pedestal. The saw furnished with the machine is a combination rip and cut-off saw, 8 in. in diameter, which fits on a mandrel carried in ball bearings. The maximum projection of the saw through the table is 2¼ in. The saw mandrel will take other saws with a ¾-in. hole, and sufficient space is provided between the collars to admit grooving or dado heads 5/8 in. thick.

The table is provided with a combination rip and cut-off gage with an adjustment for accurate alinement with the saw. When used as a ripping gage, the slide head is locked and the fence is swung around to the 90-deg. position and locked. In this service the gage opens a maximum of 9½ in. from the saw and graduated bar indicates intermediate distances. When used as a cut-off gage, the slide is released and the gage can be moved on the table, the movement being guided by a steel bar to which

the slide head is gibbed. The fence may be set for square work, or at any angle for miter work, a quadrant being provided with degree graduations for this purpose. When the cut-off gage is drawn back to its extreme position, the distance between the face of the fence and the edge of the saw is seven inches.

The machine proper is attached to a sub-base which also carries the driving motor; however, the machine can be furnished without the sub-base as it may be driven from any conveniently located



The New "Monarch" Ball-Bearing Bench Saw

motor or from an underneath countershaft. The motor regularly furnished with the saw is a ½-hp., single-phase motor for operation on 110-220-volt, 60-cycle current from a standard lighting socket, a starting switch, cord and plug being furnished for this purpose. On special order, motors can be furnished for operation on other standard currents. The driving motor is mounted on rails, permitting considerable adjustment for belt length and a special screw adjustment is provided for securing proper belt tension.

An Aid in Lining and Surfacing Track

THE Buff & Buff Manufacturing Company, Chicago, has developed and placed on the market a new instrument as an aid in lining and surfacing track which is designated as a Railign and which is an adaptation of the engineer's transit to the particular needs of this class of work. The instrument consists of a telescope with cross-hairs mounted on a standard, which differs from the ordinary tripod in that two of the legs are braced so that they maintain a fixed relation to each other, terminating in wooden blocks which rest on the head of the rail. A third leg, at right angles to the rail when the instrument is in position, is provided with a sharp pointed steel rod, having a screw adjustment for the leveling of the head of the instrument. The construction is such that when the instrument is in position on the rail and leveled the vertical cross-hair is directly over the gage line of the rail.

Rigid metal straps extend downward from the shoes of the legs on the rail along the inside face of the head of the rail and are connected by a spring strap which engages the under side of the head of the rail when the instrument is in position. Spring rods engaging the outer face of the rail hold the instrument securely when it has been placed for service. It is said that the instrument can be set up and leveled in four seconds, thus saving much time in places where train movements require it to be removed frequently from the track.

Two target rods with wooden blocks resting on the rail and clamped to it by springs on the sides are furnished with each instrument. The rods have fixed targets and are so marked that when the portion to which the target is affixed is set at zero, the cross line of the target is the same height above the head of the rail as the horizontal cross-hair of the instrument. The targets are wooden blocks with vertical and horizontal lines bisecting the face of the target, the alternate squares being painted white and red to furnish a clear indication. The block resting on the rail carries a level bubble and when the target is in place the vertical line is directly over the gage line. A small seat, with springs to clamp it to the rail is furnished to obviate the necessity of stooping over when sighting the instrument.

In lining track, the instrument is placed in position on the rail where the track is in proper line and one target is placed at a similar point ahead of where the lining is to be done, while the second target is affixed to the rail where the lining bars or track liners are working. With the vertical cross-hair of the instrument coinciding with the vertical line of the forward target the track is shifted until the intermediate target is brought to coincide also with the line of sight, when the lining gang moves forward, replaces the intermediate target and repeats the operation until the track has been brought to the proper position.

In surfacing track, a similar procedure is followed except that in this case the rods are set so that the horizontal line of the target is the same distance above the head of the rail as the horizontal cross-hair of the instrument, as has already been explained.

Lining Track with the Railign

The telescope is provided with a clamp and tangent screw so that the cross-hairs may be brought exactly to the lines of the forward target and fixed in that position. The Railign has been used on a number of railways, including the Illinois Central, the Atlantic Coast Line and the Louisville & Nashville, where it is said to have given satisfactory service.

PASSENGER STATION WILL HAVE A COLISEUM.—The new North Station to be erected by the Boston & Maine at Boston, Mass., will contain a "coliseum" on the second floor with a capacity of 18,500 persons, which will be available for sports or as a meeting place for conventions. The western wing of the building will be fitted up as a hotel and a 14-story office building is also included in the plans.

With the Associations

Roadmasters' Association

The executive committee will meet at the Auditorium Hotel, Chicago, on December 10 to select committees and to transact other business.

Bridge and Building Association

The executive committee will meet in Chicago on December 3 to organize for the ensuing year, appoint committees, etc.

Maintenance of Way Club of Chicago

At the meeting to be held at the Auditorium Hotel, Chicago, on Wednesday evening, December 21, Paul Chipman, valuation engineer of the Pere Marquette, will present a report of the service rendered by the concrete roadbed which has now been carrying main line traffic on that road for a year. Mr. Chipman assisted President Alfred of the Pere Marquette in the design and construction of this unique piece of track construction and has kept in close touch with its behavior in service.

Metropolitan Track Supervisors' Club

The first winter meeting of the Metropolitan Track Supervisors' Club was held at the Hotel Martinique, New York City, on November 19, at which time F. J. Meyer, assistant engineer on the New York, Ontario & Western, representing a special committee, presented a report on the causes of derailments and methods of correction. The reading of the report was followed by a lively discussion in which members of the operating departments of several roads took an active part.

The most important new business transacted by the club was a change in the time of its meetings from noon on Saturdays to Wednesday evenings. The date for the next meeting of the club was set for Wednesday, January 11, 1928, at 6 p. m., in the regular dinner and meeting room at the Martinique Hotel. Immediately preceding the meeting on November 19, the members stood for a few moments in silent tribute to the memory of W. C. Kidd, one of the club's founders and most active members, who died on July 5.

The Engineering Association

Unusual activity has been displayed by the committees of the American Railway Engineering Association during the last month. Eleven committees met during this period, including the Committee on Grade Crossings at Chicago on November 1-2 with 22 present; the Committee on Yards and Terminals at Norfolk, Va., on November 7-9 with 20 present; the Committee on Roadway at Chicago on November 8; the Committee on Track at Chicago on November 10-11 with 25 present; the Committee on Records and Accounts at Washington, D. C., on November 11 with 11 present; the Committee on Masonry at New York on November 15-16; the Committee on Rail in the same city on November 16; the Committee on Economics of Railway Operation at Chicago on November 17; the committees on Rules and Organization and on Wooden Bridges and Trestles in Chicago on the following day and the Committee on Economics of Railway Location in Chicago on November 28 with 12 present.

The Wood-Preservers' Association

The executive committee of the American Wood-Preservers' Association met in the offices of the Service Bureau of that organization in Chicago on November 22 to plan for the convention which will be held in Montreal, Que., on January 24-26, 1928. The Mount Royal hotel has been selected as convention headquarters. Arrangements have been made with the Michigan Central-Canadian Pacific for special cars, or for a special train if the number warrants, for those members living south and west of Chicago and Detroit, leaving Chicago at 5:40 p. m. on Sunday evening, January 22.

The program for the convention is rapidly nearing completion. A special feature this year will be the grouping of those papers of interest to the users of treated timber on Wednesday, which will be known as "User's Day."

The program, as so far arranged, is as follows:

Tuesday Morning

Opening business.

President's address: O. C. Steinmayer, superintendent timber preservation, Canada Creosoting Company, Montreal, Que.

Report of secretary-treasurer: E. J. Stocking.

Appointment of committees.

Tuesday Afternoon

Report of Committee on Preservatives, L. C. Drefahl, chairman, chemist, Grasselli Chemical Company, Cleveland, Ohio.

Paper on Some Experiments on the Toxicity of Inorganic Salts of Arsenic, by E. Bateman, chemist in forest products, Forest Products Laboratory, Madison, Wis., and R. Baechler.

Paper on The Determination of the Toxicity of Wood Preservatives, by S. C. Reeve.

Paper on the Relation of Treating Variables to the Penetration and Absorption of Preservatives into Wood, by J. D. MacLean, engineer in forest products, Forest Products Laboratory, Madison, Wis.

Paper on The Checking of Hard Maple Ties, by J. F. Harkom, Forest Products Laboratories of Canada, Montreal, Que.

Wednesday Morning

Report of Committee on the Treatment of Car Lumber, J. T. St. Clair, chairman, engineer of car construction, Atchison, Topeka & Santa Fe, Chicago.

Report of Committee on Tie Service Records, C. F. Ford, chairman, supervisor, tie and timber department, Chicago, Rock Island & Pacific, Chicago.

Address on The Economy of Framing Structural Timbers Before Treatment, by Earl Stimson, chief engineer maintenance, Baltimore & Ohio, Baltimore, Md.

Address on What the Lackawanna Has Gained From the Treatment of Ties, by G. J. Ray, chief engineer, Delaware, Lackawanna & Western, Hoboken, N. J.

Paper on Some Unusual Failures of Cross Ties, by Galen Wood, chemist engineer, Philadelphia, Pa.

Thursday Morning

Report of Committee on Plant Operation, Ed Kelly, chairman, assistant manager treating plants, Atchison, Topeka & Santa Fe, Topeka, Kan.

Report of Committee on Boiling Treatments, J. D. MacLean, chairman, engineer in forest products, Forest Products Laboratory, Madison, Wis.

Report of Service Bureau Board, A. R. Joyce, chairman, vice-president, Joyce-Watkins Company, Chicago.

Closing business.

The Material Market

THE comparison of October and November iron and steel prices appearing below dicloses fewer changes than were recorded last month. It indicates a marking up of structural steel quotations, but a further weaking in the prices of wire and wire products. Cast iron pipe suffered a slump during the month, but has apparently been restored to the figures named a month ago. The case of structural plates, shapes and bars is an interesting one, for the past month has witnessed the second effort at price stabilization in this field within six weeks, this time apparently with greater success, although the outcome is as yet by no means certain.

On November 10, the United States Steel Corporation announced an advance in structural steel to $1.80 and $1.90 per 100 lb. at Pittsburgh and Chicago, respectively, with differentials of 10 cents additional for orders of less than 100 tons. This announcement together with similar statements from other leading manufacturers resulted in some increase in business, particularly because some firms delayed in following the lead of those who had announced advances and because others allowed buyers an opportunity to cover new orders at the old prices. Therefore, while $1.80 instead of $1.75 is now generally quoted as the going rate at Pittsburgh, the new figure is understood to apply generally with equal force to large and small orders. There has also been an increasing tendency for sellers at points outside the two principal producing territories to quote f. o. b. Pittsburgh or Chicago at less than the prevailing prices at those points.

Iron and Steel Prices Per 100 Lb.

	October		November	
	Pittsburgh	Chicago	Pittsburgh	Chicago
Track spikes	$2.80	$2.80	$2.80	$2.75 to $2.80
Track bolts	3.80	3.80	3.80	3.80
Angle bars	2.75	2.75	2.75	2.75
Tie plates, steel	2.25	2.25	2.25	2.25
Boat spikes	3.10	3.10	3.10	3.10
Plain wire	2.40	2.45	$2.35 to $2.40	2.45
Wire nails, keg	2.55	2.60	2.50	2.55 to 2.60
Barb wire, galv.	3.25	3.30	3.20	3.25
C. I. pipe, 6 in. to 12 in., ton		$34.20 to 37.20		$34.70 to 37.20
Plates	1.75	1.85	1.80	1.90
Shapes	1.75	1.85	1.80	1.90
Bars, soft steel	1.75	1.85	1.80	1.90
Rivets, struc.	$2.75 to 3.00	2.85 to 3.10	2.75 to 3.00	2.85 to 3.10
Conc. bars, billet	1.75 to 1.80		1.80 to 1.90	
Conc. bars, rail	1.65 to 1.75	1.90	1.65 to 1.70	1.80
Rails, per gross ton, f.o.b. mills		43.00		$43.00

A comparison of orders placed or inquiries issued by railroads to date for their rail requirements for 1928, with their actual rail purchases for use in 1927, offers good foundation for the conclusion that the volume of rail orders for the new year will be at least as large as that for orders placed for 1927 delivery. Orders recently placed included 10,000 tons for the Boston & Maine, 177,140 tons for the New York Central, 35,000 tons for the St. Louis-San Francisco, 20,000 tons for the Wabash and 46,700 tons for the Erie. In addition to the above, inquiries have been issued for rails as follows: Southern Pacific, 94,000 tons; Missouri Pacific, 37,950 tons; International Great Northern, 10,000 tons; and Texas & Pacific, 14,400 tons of 110-lb. rail to supplement an order recently placed for 9,000 tons. Orders are also pending on 48,800 tons for the Chicago & North Western.

Reports current during the early part of October indicate a tendency on the part of the roads to withhold shipping orders against contracts placed, with the result that production of rails was not increased in proportion to the volume of orders received by the mills. However, this situation changed toward the end of the month with a definite increase in output. In fact, it is said that the Pittsburgh rail mill of the leading manufacturer was able to resume full operations nearly a month earlier than in past years. One of the Canadian mills also has resumed operations after a protracted shut down.

Business in track fastenings and tie plates, which must necessarily follow as a result of rail purchases, is lagging, a tendency which must be ascribed to the prevailing assumption that deliveries can always be had promptly. The Missouri Pacific and its subsidiary, the International Great Northern, are in the market for 18,000 tons and 7,500 tons of tie plates, respectively. The immediate requirements of the New York Central are estimated at 20,000 to 25,000 tons. Recent inquiries for freight equipment, aggregating over 8,000 cars, has introduced a new note in the structural steel market as has a recent contract for 6,000 tons of structural steel for the approaches to the new Chesapeake & Ohio bridge over the Ohio river at Cincinnati.

The scrap market is exceedingly quiet. It is said that in some markets the business done has not been sufficient to establish actual values. Such sales as have been made indicate a further decline in prices.

Scrap Prices Per Gross Ton at Chicago

	October	November
Relaying rails (including angle bars)	$26.00 to $31.00	$26.00 to $31.00
Rails for rerolling	14.50 to 15.00	13.50 to 14.00
Rails less than 3 ft. long	14.75 to 15.25	14.50 to 15.00
Frogs and switches cut apart	12.75 to 13.25	12.75 to 13.25
Steel angle bars	13.50 to 14.00	13.25 to 13.75

Sales of soft woods in the United States for the first 45 weeks of 1927, according to the statistics of the National Lumber Manufacturers' Association, totaled 11.7 per cent less than in the same period in 1926. Production was 9.7 per cent less. While Southern Pine mills made the best showing with a loss of only 7.8 per cent in orders, the total orders for the first ten months of 1927 represent a smaller volume of business than for the same period of each of the three preceding years. The loss of business in the West Coast field as compared with 1926 was 14.7 per cent, while in the Western Pine field it was 13.6 per cent. With the present seasonal slackening of construction operations the demand for lumber has fallen off, but Southern prices have been fairly stable. Douglas fir prices are soft and there is again talk of a general shutdown to curtail stocks.

Southern Pine Mill Prices

	October	November
Flooring, 1x4, B and B, flat	$35.52	$37.00
Boards, 1x8, No. 1	32.38	35.00
Dimension, 2x4, 16, No. 1, common	23.40	24.30
Dimension, 2x10, 16, No. 1, common	25.36	25.40
Dimension, 2x4, 16, No. 2, common	20.53	20.60
Dimension, 2x10, 16, No. 2, common	19.92	18.70

Douglas Fir Mill Prices

	October	November
Flooring, 1x4, B and btr., flat	$24.50	$24.00
Boards, 1x8, No. 1	16.25	16.00
Dimension, 2x4, 16, No. 1, common	18.00	17.75
Dimension, 2x10, 16, No. 1, common	18.00	17.50
Dimension, 3x3 to 4x12, No. 1, common	19.00	18.50
Dimension, 5x5 to 12x12, No. 1, common rough	17.50	17.25

No changes have been noted in the prices of Portland cement. The following list gives the prices per barrel in carload lots, not including package:

New York	$2 03	Minneapolis	$2.22
Pittsburgh	2.04	Denver	2.85
New Orleans	2.32	Dallas	2.05
Chicago	2.05	San Francisco	2.51
Cincinnati	2.32	Montreal	1.41

Railway News

Briefly Told

The Chicago, Burlington & Quincy has eliminated the number 13 from its passenger trains in deference to the reluctance that many people feel against patronizing a train bearing that number.

Sir Henry Thornton, president of the Canadian National, in compliance with a request from the government of Mexico to the government of Canada, has gone to Mexico to make an extensive survey of the National Railways of Mexico and to report to the Mexican government his opinions as to the methods for improving the efficiency of the lines.

The city of Lakeland, Fla., will engage in the railway business if the Interstate Commerce Commission grants its request that the Lakeland Railroad Company, owned by the city, be authorized to operate as a common carrier a line 10 miles in length between Lakeland and Naylor, Ga., purchased from the Milltown Air Line.

At the annual convention of the National Association of Railroad and Utilities Commissioners at Dallas, Tex., on October 18-21, the Committee on Public Ownership and Operation presented a majority report opposing government ownership. A minority report favoring government ownership was written by Commissioner Joseph B. Eastman of the Interstate Commerce Commission.

The board of directors of the Great Northern has approved a contract with the Southern Pacific for joint use of the tracks of the latter railway between Chemult, Ore., and Klamath Falls, 75 miles. When the line now under construction between Bend, Ore., and Chemult is completed the G. N. will maintain service between Wishram, Wash., on the line of its subsidiary, the Spokane, Portland & Seattle, and Klamath Falls, via the Oregon Trunk, 298 miles.

Revenue freight car loadings for the week ending November 19, totaled 986,103, an increase of 11,241 cars over the preceding week. As compared with the corresponding week of last year there was a decrease of 92,709 cars, and a decrease of 71,820 cars as compared with 1925. The cumulative total for the first 47 weeks of the current year is 47,459,242 as compared with 48,586,821 and 46,600,612 for the corresponding periods in 1926 and 1925, respectively.

The Illinois Commerce Commission on November 23 gave permission to the Chicago & North Western and the Chicago Union Station Company to sell air rights over portions of their tracks along the Chicago river in Chicago. The North Western asked approval of its sale of air rights to Marshlal Field & Co. for the construction of a warehouse while the Union Station Company asked to be allowed to sell air rights to the Chicago Daily News for the construction of an office building.

The Railway Business Association, at its meeting in New York on November 16, adopted a resolution that railway estimates for capital and maintenance expenditures should cover periods of five years, stating that this will promote foresight and hence thrift. It cited as an advantage of this plan, the systematization of purchases more evenly over the years, enabling supply manufacturers to operate more economically and thus affecting the roads favorably.

Frank H. Alfred, president of the Pere Marquette, in a large poster, suggests that if the state cannot educate the careless motorist to be careful it should withdraw from him the privileges of the highway. Mr. Alfred says that in 19 accidents at highway crossings on his road in October, it was the automobile that ran into the train, resulting in two fatal injuries and 11 less serious ones. Most of the automobiles involved were of little value, indicating that the care exercised by the driver is proportionate to the value of the car.

According to a report by the Bureau of Railway Economics, capital expenditures by the Class I railroads for roadway and structures in the first nine months this year amounted to $365,223,000, an increase of $7,153,000 or two per cent, as compared with the same period last year. Total capital expenditures of the Class I roads during the first nine months of 1927 totaled $570,000,000, a decrease of $58,878,000 as compared with first nine months of 1926, the decrease being due to smaller expenditures for equipment which were $66,000,000 less this year than in 1926.

The Parker railroad consolidation bill is to be re-introduced at the opening of Congress in the same form in which it stood at the end of the last session, according to Chairman Parker of the House Committee on Interstate and Foreign Commerce. Mr. Parker said that it is planned to hold further hearings on the bill for the purpose of completing the revisions which were begun during the last session. He also said that Commissioner Hall of the Interstate Commerce Commission probably would be the first witness and that the tentative bill had been considered by the Association of Railway Executives, the shippers and others.

The city of Cincinnati, which owns the Cincinnati Southern, extending from Cincinnati, Ohio, to Chattanooga, Tenn., has made a new lease for that property to the Cincinnati, New Orleans & Texas Pacific for 99 years, in conformity with the result of a popular vote on the subject on November 8. The new lease will replace the present lease which expires in 1966 and was considered necessary to secure the program of extensive improvements planned for that line. As a result of the execution of the new lease, the C. N. O. & T. P. will construct immediately, with its own capital, a second main track between Williamstown, Ky., and Danville, 77 miles, at an estimated cost of $13,200,000.

The Supreme Court of the United States, in reversing the decision of a lower court in favor of the estate of a man killed by a Baltimore & Ohio train at a grade crossing, laid down a standard of conduct for motorists and others crossing railway tracks. Justice Holmes, who delivered the opinion said in part: "When a man goes upon a railroad track, he knows that he goes to a place where he will be killed if a train comes upon him before he is clear of the track. He knows that he must stop for the train, not the train stop for him. In such circumstances it seems to us that if a driver cannot be sure otherwise whether a train is dangerously near he must stop and get out of his vehicle, although obviously he will not often be required to do more than to stop and look. It seems to us that if he relies upon not hearing the train and takes no further precaution he does so at his own risk. It is true that the question of due care very generally is left to the jury. But we are dealing with a standard of conduct and when the standard is clear it should be laid down once for all by all courts."

Personal Mention

General

A. P. Ruddiman, chief engineer of the Detroit, Toledo & Ironton, with headquarters at Dearborn, Mich., has been elected vice-president and general manager, with headquarters at the same point, to succeed **F. L. Rockelman,** who was recently appointed sales manager of the Ford Motor Company.

R. K. Rochester, assistant general manager of the Eastern region of the Pennsylvania, with headquarters at New York, an engineer by training and experience, has been appointed general manager of the Long Island, with headquarters in the same city. A photograph of Mr. Rochester and a sketch of his railroad career were published on page 307 of the July issue of *Railway Engineering and Maintenance.*

A. B. Hillman, roadmaster of the Belt Railway of Chicago, with headquarters at Clearing, Ill., has been promoted to assistant trainmaster, with headquarters at the same point. Mr. Hillman was born on December 24, 1889, at Chicago and graduated from the University of Illinois in 1914, entering railway service in June of the same year as a rodman on the Chicago & Western Indiana at Chicago. By successive promotions be became assistant engineer on maintenance in October, 1916, and with the exception of two years of army service from 1917 to 1919, where he was a captain of infantry, including six months' overseas duty, he continued in that position until 1924 when he was promoted to roadmaster of the Belt Railway of Chicago, with headquarters at Clearing, Ill., which position he was holding at the time of his recent promotion to assistant trainmaster.

Carl Bucholtz, assistant general manager of the Western district of the Erie, with headquarters at Youngstown, Ohio, whose railway training embraced experience in the maintenance of way and engineering departments, has been promoted to general manager, with headquarters at the same point. Mr. Bucholtz was born on March 21, 1883, at Baltimore, Md., and was educated at Loyola College. He entered railway service on June 6, 1902, as a special machinist apprentice in the Mount Clare shops of the Baltimore & Ohio at Baltimore and in June, 1904, became maintenance of way inspector. In March, 1906, he was promoted to assistant engineer on the Baltimore division and in August, 1907, he was further promoted to assistant division engineer of the Cumberland division, with headquarters at Cumberland, Md. From February, 1908, to December of the same year he was supervisor of track with headquarters at Rowlesburg, W. Va. In December, 1908, he became maintenance of way inspector on the Missouri Pacific system at Little Rock, Ark., and in June, 1910, was promoted to division engineer of the Joplin division, with headquarters at Nevada, Mo. On November 3, Mr. Bucholtz became assistant engineer on the Erie with headquarters at Cleveland, Ohio, and while serving in this capacity was assigned to special duties for the assistant general manager. On June 1, 1915, he was promoted to division engineer on the Meadville division, with headquarters at Meadville, Pa. On May 1, 1916, he entered the transportation department as trainmaster on the Marion division, with headquarters at Huntington, Ind., and was promoted successively to assistant superintendent and superintendent of the Mahoning division, with headquarters at Youngstown, Ohio. He was further promoted to assistant general manager of the Western district in February, 1927, which position he was holding at the time of his recent promotion to general manager.

Engineering

C. F. W. Felt, chief engineer of the Atchison, Topeka & Santa Fe system, with headquarters at Chicago, has been granted a leave of absence on account of illness and **G. W. Harris,** assistant chief engineer, with headquarters at Chicago, has been promoted to acting chief engineer, with headquarters in the same city,

Guy S. Smith, whose promotion to division engineer on the Missouri Pacific, with headquarters at Bush, Ill., was noted in the November issue, was born on December 20, 1889, at Imperial, Neb. Mr. Smith graduated from the University of Kansas in 1912, and on May 30 of the same year entered railway service with the Missouri Pacific, serving as rodman and instrumentman on the Central Kansas, Southern Kansas and Central divisions until 1917, when he was promoted to assistant engineer, in which capacity he was located first on the Central division and later on the Wichita division, From 1920 to 1926 he was assistant engineer in the office of the chief engineer and the engineer maintenance of way at St. Louis Mo., when he became assistant division engineer of the Colorado division. In May, 1926, he was made assistant engineer on the Southern Kansas division, with headquarters at Coffeyville, Kan., which position he was holding at the time of his recent promotion to **division engineer.**

H. W. Fenno, division engineer on the New York Central, with headquarters at Chicago, has been promoted to engineer of maintenance of way of the lines west of Buffalo, succeeding **Charles Yoder,** notice of whose death was published in the October issue. **F. J. Jerome,** trainmaster on the Western division has been appointed division engineer at Chicago to succeed Mr. Fenno.

Mr. Fenno was born on December 16, 1870, at Dorchester, Mass., and was educated at Lowell Institute at Boston, Mass. He entered railway service in November, 1891, in the engineering department of the New York & New England (now a part of the New York, New Haven & Hartford) where he was engaged on preliminary and location surveys between South Norwalk, Conn., and New York. From January, 1893 to October, 1904, he was in the service of the Boston & Albany, being first assistant engineer in the office of the division engineer during the last two years of that period. In October, 1904, Mr. Fenno was appointed chief draftsman and office engineer on the Lake Shore & Michigan Southern (now a part of the New York Central and in 1906 was promoted to resident engineer of the Eastern division, with headquarters at Dunkirk, N. Y. In February, 1913, he was transferred to the Western division, with headquarters at Chicago and in March, 1916, the Illinois division was added to his territory. He was promoted to division engineer in 1917, which position he was holding at the time of his promotion to engineer of maintenance of way of the lines west of Buffalo on November 1.

Mr. Jerome was born on May 26, 1890, at Painesville, Ohio, and graduated from the Massachusetts Institute of Technology in 1914. He entered railway service on July 6 as a transitman on the New York Central and was promoted to assistant division engineer in March, 1917. He was promoted to trainmaster in August, 1923, which position he was holding at the time of his promotion to division engineer on November 1.

Track

R. E. Patterson, roadmaster on the St. Louis district of the Missouri-Kansas-Texas, with headquarters at Sedalia, Mo., has retired after 32 years' service with that road.

H. C. Koch, chief clerk of the maintenance of way department of the Belt Railway of Chicago, with headquarters at Clearing, Ill., has been promoted to roadmaster, with headquarters at the same point, to succeed **A. B. Hillman,** whose promotion to assistant trainmaster is noted elsewhere in this issue. **G. G. Hensley,** extra gang foreman has been promoted to assistant roadmaster, with headquarters at Clearing.

M. Canavan, district roadmaster on the Wyoming division of the Union Pacific, with headquarters at Laramie, Wyo., has been promoted to general roadmaster of the same division to succeed **Arthur Yung,** who has been transferred to the Kansas division, with headquarters at Kansas City, Mo., succeeding **J. J. Culliton,** resigned. **D. R. Byrne,** gen-

eral foreman on the Western division, has been promoted to district roadmaster at Laramie to succeed Mr. Canavan.

L. T. Day, general foreman on the Chicago & North Western, has been promoted to roadmaster, with headquarters at Proviso, Ill., a newly created position. Mr. Day will have charge of the Proviso yard.

Richard H. Carter, whose promotion to supervisor on the Illinois Central, with headquarters at Kankakee, Ill., was noted in the November issue, was born on August 16, 1891, at New York City. He was educated at St. Michaels College, Toronto, and the University of Ottawa, entering railway service in April, 1911, as chainman on construction on the Canadian Pacific. In September of the following year he became a rodman in the bridge department of the Canadian Northern (now a part of the Canadian National). From December, 1912 to April, 1913, he was a rodman on the construction of the Alberta & Great Western and from the latter date to August, 1914, he was a rodman on the Grand Trunk Pacific, both of which roads are now parts of the Canadian National. He entered the service of the Illinois Central on September 29, 1914, as a chainman and by successive promotions was made an instrumentman in June, 1916. Mr. Carter entered the army on May 29, 1917, and served overseas with the 13th Engineers for 21 months. On his return to civil life in June, 1919, he re-entered the employ of the I. C. as an instrumentman on the New Orleans division and in December, 1924, was promoted to assistant engineer on the Indiana division. He was transferred to the Chicago Terminal division in December, 1924, where he was located at the time of his recent promotion to supervisor.

R. D. Burns, assistant supervisor on the Maryland division of the Pennsylvania, with headquarters at Chester, Pa., has been promoted to supervisor on the Allegheny division, with headquarters at Du Bois, Pa., to succeed **C. H. Frick**, whose transfer to Kittaning, Pa., on the same division, was noted in the November issue. **C. P. Montague**, rodman on the Pittsburgh division, has been promoted to assistant supervisor on the Nenovo division, with headquarters at Erie, Pa., to take the place of **A. P. Talbot**, who has been transferred to the Eastern region.

Mr. Burns was born on November 2, 1893, at Paoli Pa., and was educated at the Pennsylvania State College. He entered railway service on June 12, 1916, as a laborer on the Philadelphia division of the Pennsylvania, and on July 16, 1917, became a chainman at Camden, N. J., serving in this capacity and as a rodman at various locations until May 1, 1924, when he was promoted to assistant supervisor on the Trenton division at Phillipsburg, N. J. On April 6, 1926, he was promoted to main line assistant supervisor on the Middle division at Altoona, Pa., and on May 12, 1927, was transferred to the Maryland division, with headquarters at Chester, Pa.

Bridges and Buildings

W. O. Eggleston, inspector of maintenance of way on the Erie, with headquarters at Huntington, Ind., has retired after a continuous service of 58 years, 10 months.

C. O. Henry, supervisor of bridges and buildings on the Michigan division of the Cleveland, Cincinnati, Chicago & St. Louis, with headquarters at Wabash, Ind., has been transferred to the Cleveland division, with headquarters at Galion, Ohio, to succeed **Robert F. Henry**, who has retired after 37 years service.

A. Beaton, bridge foreman on the Vancouver division of the Canadian Pacific, has been promoted to bridge and building master on the Brandon division, with headquarters at Brandon, Man. **D. Smith**, formerly bridge and building master at Lethbridge, Alta., has been appointed bridge and building master on the Saskatoon division, with headquarters at Saskatoon, Sask.

Obituary

James Kerr, at one time supervisor of bridges on the Grand Trunk (now a part of the Canadian National) at Portland, Me., and subsequently at Richmond, Que., who retired about 15 years ago, died at Montreal, Que., on October 5, at the age of 75.

A. Shumate, roadmaster on the Chicago, Rock Island & Pacific, with headquarters at Fairbury, Neb., died on November 25.

B. R. Burch, roadmaster on the Savannah division of the Central of Georgia, with headquarters at Savannah, Ga., was killed on November 24, when the motor car on which he was riding was struck by a train on a curve near Covington, Ga.

Charles B. Hoyt, formerly superintendent of track, maintenance and construction on the Nickel Plate district of the New York, Chicago & St. Louis with headquarters at Cleveland, Ohio, until his retirement in 1924, died at his home at Bellevue, Ohio, on November 4. Mr. Hoyt was born on February 12, 1860, at Adrian, Mich., and entered railway service in 1888 as a roadmaster's clerk on the Lake Shore & Michigan Southern (now a part of the New York Central). He was promoted to roadmaster of the Ft. Wayne division in 1893 and later was transferred to the Coldwater division. Mr. Hoyt was appointed chief supervisor of track on the Nickel Plate in August, 1898, and in October, 1905, was promoted to trainmaster on the Western division. He was further promoted to superintendent of track, maintenance and construction in August, 1907, which position he held until his retirement in 1924.

William H. Hoyt, chief engineer of the Duluth, Missabe & Northern, with headquarters at Duluth, Minn., died at Rochester, Minn., on November 10. Mr. Hoyt was born on October 13, 1867, at Owatanna, Minn., and graduated from the University of Minnesota in 1890. He entered railway service in the same year as an assistant engineer on the Duluth & Iron Range. From 1895 to 1899 he was a junior assistant engineer with the United States government and for the next two years he was principal assistant city engineer of Duluth. He returned to railway service in 1901 as an assistant engineer on the Duluth, Missabe & Northern and in 1906 was promoted to assistant chief engineer. He was further promoted to chief engineer on March 1, 1920, which position he was holding at the time his death.

William H. Hoyt

Nelson H. LaFountain, general supervisor of buildings of the Chicago, Milwaukee & St. Paul, with headquarters at Chicago, died in that city on November 3, following an illness of four days from heart trouble. Mr. La Fountain was 70 years of age and had been in the employ of the C. M. & St. P. for 46 years. He was born on September 23, 1857, at Plattsburg, N. Y., and entered railway service in 1880 as a carpenter on the Chicago & North Western. Mr. La Fountain entered the service of the C. M. & St. P. in 1881 as a building foreman and was promoted to chief carpenter on the lines in South Dakota in 1885, being transferred to the Wisconsin lines in 1887. He was a building inspector for a short time in 1888, and later in the same year was made chief carpenter of the Kansas City division. In 1891 he was promoted to assistant district carpenter and in 1896 to district carpenter at Marion, Iowa, and later was transferred to Chicago. He was promoted to assistant superintendent of bridges and buildings at Chicago in 1901, and in 1919 was further promoted to general supervisor of buildings, with headquarters at the same point, which position he was holding at the time of his death.

Construction News

The Alabama & Western Florida has applied to the Interstate Commerce Commission for permission to extend its line 12½ miles from Chipley, Fla., to Graceville. The new extension is planned to serve a lime crushing plant and a saw mill.

The Atchison, Topeka & Santa Fe reached an agreement on November 18 with the authorities of Oklahoma City, Okla., for the construction of a new passenger station and the elevation of its line through the city. The location of the station will be on or adjacent to the site of the present station.

A contract for the construction of an automatic electric sand handling and drying plant, with a storage capacity of 540 tons of wet sand in a steel pocket, at Temple, Tex., has been awarded to the Ogle Construction Company, Chicago.

The Baltimore & Ohio has awarded a contract to the Vang Construction Company, Cumberland, Md., for the construction of concrete piers of a bridge over the Miami river and Erie canal at Woodsdale, O. This project is to cost $100,000.

A contract has been let to Joseph E. Nelson & Sons, Chicago, for the construction of water treating plants at Defiance, Ohio, and Syracuse, Ind., at a total cost of about $18,000. A contract has also been let to the Pittsburgh-Des Moines Steel Company, Pittsburgh, Pa., for the installation of a water supply system at Yoder, Pa., at a cost of about $12,000.

The Bellefonte Central has applied to the Interstate Commerce Commission for authority to build an extension from State College, Pa., to Fairbrook, 6 miles.

The Boston & Maine has awarded a contract to the Roberts & Schaefer Company, Chicago, for automatic electric locomotive coaling plant equipment for installation at Troy, N. Y.

The Burlington, Muscatine & Northwestern, through its president, E. L. Tobie, has announced plans for the rehabilitation of 44 miles of the 54-mile line between Muscatine, Iowa, and Burlington, which was recently placed in operation in the vicinity of Muscatine after being closed for traffic since March, 1927. The total expenditure for the rehabilitation of the line, including 10 miles which have already been reconstructed, is estimated at $600,000.

The Canadian National has prepared plans for the construction of a brick freight station and office building at Melfort, Sask. A contract for constructing dwellings, bunkhouses and tool houses at Bengough, Sask., Roucott, Harptree and Willowbunch has been let to W. A. Dutton, Winnipeg, Man. The contract for the construction of a reinforced concrete and brick freight station at Saskatoon, Sask., has been awarded to Cassidy & Co., Saskatoon. The structure will have outside dimensions of 383 ft. by 41 ft. and a floor area of 14,400 sq. ft. A contract for the construction of a 100-ton mechanical coaling dock at Turtleford, Sask., has been awarded to the Clayton Company, Ltd., Winnipeg, Mann. A contract for the construction of a brick freight shed and office at Melford, Sask., has been awarded to Wilson & Wilson, Regina, Sask.

The Canadian Pacific has awarded a contract for the construction of buildings on the extension from Maxstone, Sask., west 30 miles, on the extension of the Lanigan-Melfort branch from Melfort, Sask., north 10 miles and on the Cutknife-Whitford Lake, Sask., extension, 66 miles, to W. A. Dutton, Winnipeg, Man. J. N. Simmons, Winnipeg, has been awarded the contract for the construction of buildings on the branch under construction between Asquith, Sask., and Cloan, 20 miles.

The Central of Georgia has awarded a contract to the Williams Lumber Company, Columbus, Ga., for the construction of a station at Thomaston, Ga. which will cost $30,000.

The Chicago & Northwestern has awarded contracts for the construction of a 1,000,000-bu. addition to the grain elevator at Council Bluffs, Iowa, to cost approximately $350,000. Excavation will be done by the C. A. Wickham Co., Council Bluffs; piles will be driven by Whitney Brothers & Co., Duluth, Minn., while the Barnett-Record Company, Minneapolis, Minn., will construct the addition proper which will consist of 35 reinforced concrete bins and 29 interspaces, each 110 ft. high and covering an area 160 ft. by 113 ft.

The Chicago, Milwaukee & St. Paul has been authorized by the Federal Court at Chicago to expend $100,360 for the construction of a bridge over the Wisconsin river two miles west of Lone Rock, Wis., to replace seven 105 ft. truss spans which were built in 1886. The bridge will consist of six 52 ft. through girder spans and four 103 ft. pony truss spans. Authorization has also been given for the construction of a 200-ft. double track bridge over the Iroquois river, three miles north of Webster, Ill., at a cost of $42,400. This bridge will consist of two 90-ft. deck girder spans and four 57-ft. deck girder spans and will replace the bridge destroyed by a derailed coal train on September 19. This company will also construct a 100-ton mechanical balance bucket type coaling station at Bonilla, S. D., at a cost of $16,100, replacing bucket and derrick type coaling stations at Tulare, S. D., and Woonsocket.

The Chicago, Rock Island & Pacific has made a tentative agreement with the St. Louis-San Francisco and authorities of Oklahoma City, Okla., which is subject to the approval of the Interstate Commerce Commission, whereby a new passenger station to serve these two railroads will be constructed in that city on the right of way of the Frisco south of the business section. At the same time the Rock Island agrees to remove its tracks and facilities from their present location in the business district contingent upon the popular approval on November 29 of a $4,000,000 bond issue. The proceeds from the sale of the bonds will be used to purchase the present Rock Island right of way and passenger terminal property. The agreement was reached at a hearing held at Oklahoma City before J. B. Keeler, Interstate Commerce Commission examiner on November 17.

The Cincinnati Union Terminal Company has been formed to construct a new union station at Cincinnati, Ohio, and a preliminary contract has been executed between representatives of the Baltimore & Ohio; the Chesapeake & Ohio; the Cincinnati, New Orleans & Texas Pacific; the Cleveland, Cincinnati, Chicago & St. Louis; the Louisville & Nashville; the Norfolk & Western; the Pennsylvania and the Cincinnati Railroad Development Company, according to a formal announcement on November 5. A statement made by George D. Crabbs, president of the Development company, Robert A. Taft, secretary, and H. A. Worcester of the C. C. C. & St. L. gives the general location of the station as the Mill Creek valley in the west end of the city, where coach and engine terminals will also be provided. Henry M. Waite, former city engineer of Cincinnati and city manager of Dayton, Ohio, will be chief engineer and C. A. Wilson, former chief engineer of the Wheeling & Lake Erie and the Cincinnati, Hamilton & Dayton (now a part of the B. & O.), will be consulting engineer. It is estimated that the cost of the entire project, including the passenger station, coach and engine terminals, improved freight facilities and the expenditures by the various railroads to conform to the plan, will be approximately $75,000,000, about half of which will be necessary for the passenger facilities. Surveys were begun on November 7, and it is expected that the first contracts will not be let before May 1, 1928, and that the work will be completed during 1932.

The Cleveland Union Terminals has awarded a contract for the construction of a reinforced concrete viaduct and runway at Prospect avenue, Cleveland, Ohio, to the Hecker-Moon Company, Cleveland, at a cost of about $200,000.

The Erie plans the elimination of a grade crossing at Hilburn road in Suffern, N. Y., at an estimated cost of $200,000.

The Eureka-Nevada has awarded a contract to the Trus-

con Steel Company, Youngstown, Ohio, for the construction of a steel engine house at Palisade, Nev., to replace a building destroyed by fire at an estimated cost of $12,000.

The Hudson Bay Railway will be extended from Mile 356 to Ft. Churchill, Man., which was recently chosen as the Hudson Bay terminus of the road. The length of the extension will be 154 miles and the Canadian government has awarded the contract for grading to Stewart & Cameron, Ltd., of Winnipeg, Man., at an estimated cost of $1,250,000. The supervision of this work, as well as the laying of the track and the building of the necessary structures, will be under the Canadian National as agents for the government.

Construction of a branch of this railroad from the Pas, Man., northwest to the Flin Flon mining area in northern Manitoba, 85 miles, will be undertaken by McLean & Tomlinson, Winnipeg, Man., following the agreement of the Manitoba Provincial Government to make payments up to $100,000 annually for five years to guard against operating losses and the decision of the Whitney mining interest to contribute $250,000 to the work. Preliminary surveys have been completed and the location survey is now under way. The agreement with the contractor provides that the project must be completed within one year and estimates the cost of the entire line at $3,500,000. When completed the branch will be operated by the Canadian National.

The Louisville & Nashville closed bids on November 30 for the construction of a line between Chevrolet, Ky., and Hagans, 14 miles, as a link in the forming of a connection with the Clinchfield at Miller Yard, Va., through trackage rights over the Interstate from Norton, Va., to Miller Yard, 18 miles. This project, which will involve the construction of three tunnels, will cost approximately $5,287,000.

The Missouri Pacific has started upon a program of improvement of yard and terminal facilities with company forces at Poplar Bluff, Mo., which is expected to involve a total expenditure of about $180,000. Included among the improvements are the acquisition of additional right of way, the construction of additional and longer yard tracks with rectification of alinement, the replacement of a 75-ft. turntable with a 100-ft. turntable, the installation of an additional cinder conveyor, the installation of a 100,000-gal. steel tank with necessary pipe lines and additional water columns, the construction of a boiler house with elevated track and coal pocket and the installation of a boiler and two air compressers.

The New York Central has plans under consideration for the elimination of nine grade crossings in Westchester County, New York, at an estimated cost of $2,300,000. This road also plans the construction of a steel bridge on its line at Buffalo, N. Y.

The New York, Chicago & St. Louis has awarded a contract for the construction of a one-story brick, steel and concrete freight station at Cleveland, Ohio, to the S. W. Emerson Company, Cleveland, at a cost of about $150,000. The outside dimensions of the building will be 80 ft. by 460 ft.

The Nipissing Central has awarded a contract to Angus & Taylor, Ltd., North Bay, Ont., for the construction at Rouyn, Que., of a reinforced concrete and bick passenger station, with outside dimensions of 100 ft. by 26 ft., and a frame freight station, with outside dimensions of 100 ft. by 30 ft.

The Norfolk & Western will construct a yard in the immediate future on property acquired several months ago just north of Winston-Salem. The yard will contain approximately 14 miles of track, track scales, water service facilities and yard offices. The main line of the railway through Winston-Salem will also be double tracked from Fourth street to Liberty street, and from Fourteenth street to Oakland street. It is estimated that the cost of facilities will approximate $800,000. The new yard just north of the city limits and adjoining the present Norfolk & Western right-of-way will contain 13 yard tracks each with a capacity of from 70 to 90 cars; two car repair tracks; one wye track and one running track.

The Northern Pacific has awarded a contract for the construction of water treating plants at 24 points on its line in North Dakota and Montana to E. J. Dunningan, St. Paul, Minn. The item in regard to these plants was erroneously attributed to the Great Northern in the November issue.

The Oregon-Washington Railway & Navigation Company, the Northern Pacific, the Chicago, Milwaukee & St. Paul, and the Puget Sound Electric will share in the cost of an 800-ft. steel and concrete highway viaduct at Argo, Wash. A contract for construction has been let to the J. A. McEachern Company, Seattle Wash., at a cost of about $230,000.

The Pennsylvania has awarded a contract to the Pittsburgh-Des Moines Steel Company, Pittsburgh, Pa., for the erection of a 100,000-gal. steel water tank in connection with a sprinkler system on Pier K at Jersey City, N. J. A contract has also been awarded to Sinclair & Grigg, Philadelphia, Pa., for the construction of an office building and the enlargement of a restaurant in the new perishable products terminal at Philadelphia at a cost of $30,000.

The Reading is preparing plans for the electrification of its suburban lines at Philadelphia and it is expected work will be begun on the Chestnut Hill branch early in 1928, to be completed in about two years. The electrification of lines to Glenside and the one to Langhorne will, it is expected, follow. It is estimated that the cost of electrifying the Chestnut Hill branch will be nearly $5,000,000 which includes the expense of eliminating a number of grade crossings.

The St. Louis-San Francisco is preparing plans for the construction of a passenger station at Poplar Bluff, Mo. It is expected that a request will be made for bids about December 1.

The St. Louis Southwestern has purchased 110 acres of land at Jonesboro, Ark., for the purpose of constructing a yard at some time in the future.

The Southern Pacific and the Great Northern have jointly purchased 7.5 acres of land at Klamath Falls, Ore., for the construction of a freight terminal in the future.

The Texas & Pacific plans the construction of a steel bridge 1,900 ft. long over the Atchafalaya river near Melville, La. The bridge will consist of one vertical lift span, capable of being raised to a point 53 ft. above maximum flood height, and having a clear span of 160 ft., and five fixed spans, that will be placed 3 ft. above maximum flood height.

A contract has been awarded to Gifford-Hill & Co., for the construction of a water supply reservoir 2½ miles north of Wills Point, Tex., to cost about $75,000. This project involves about 50,000 yd. of grading, the construction of a pump house with the installation of pumping machinery and the construction of a pipe line one mile in length, to connect the reservoir with service tanks on the main line at Wills Point. The same contractor has been given a contract for the removal of rail on the abandoned Midland & Northwestern between Midland, Tex., and Seminole, 60 miles. Bids have been closed for remodeling and enlarging the combined freight and passenger station at Midland, Tex., at a cost of about $15,000.

The Texas-New Mexico of which G. O. Bateman of Breckenridge, Tex., is president, has applied to the Interstate Commerce Commission for authority to build a line from Monahans through Kermit, Tex., to a point on the Texas-New Mexico state line, about 35 miles.

The Vancouver Harbor Board has received authorization for the construction of a railroad subway under Lonsdale avenue, Vancourver, B. C., to connect the Harbor Board terminal railway with the Pacific Great Eastern. It is expected that the cost of the work will be more than $150,000.

The Wabash plans the construction of a passenger station on Delmar boulevard, St. Louis, Mo., in conjunction with a viaduct now under construction at that point. The cost of the station is estimated at $300,000.

Supply Trade News

General

The Truscon Steel Company will enlarge its sash and steel window departments at Youngstown, Ohio.

The Lebon Company, Chicago, has moved its New York office from 60 Broadway to room 430, 165 Broadway.

The Parsons Company, Newton, Iowa, has prepared plans for a one-story addition to its plant to cost $20,000.

The Celite Products Company has moved its Chicago office from 53 West Jackson boulevard to its own building at 225 East Superior street.

Personal

George W. Torrence, manager of the Chicago office of the Pittsburgh Testing Laboratory, died suddenly at his home in that city on November 16.

H. G. Steinbrenner, vice-president of the Industrial Brown Hoist Corporation, Cleveland, Ohio, died at Chicago on November 16.

Frank K. Tutt, vice-president of the Hanna Stoker Company, Cincinnati, Ohio, with headquarters at St. Louis, Mo., has resigned to become a special representative of the Bird-Archer Company, with headquarters at Chicago. Mr. Tutt was born on December 30, 1876, at Lexington, Mo., and entered railway service with the Missouri Pacific in 1891, being associated later with the Southern, the St. Louis-San Francisco, the Denver & Rio Grande Western and the Missouri-Kansas-Texas. In 1924, he resigned from the latter road as mechanical superintendent to become a representative of the Hanna Stoker Company and was advanced successively to sales manager and vice-president, which latter position he was holding at the time of his recent resignation to become a special representative of the Bird-Archer Company.

William S. Miller, recently appointed manager of railroad sales for the Northwest Engineering Company, was born on May 17, 1888, at San Francisco, Cal., and graduated from Leland Stanford University in 1911. In the same year he became a rodman for Stone & Webster on hydro-electric construction in Washington, later being advanced to instrumentman. In 1914, he was appointed sales manager of the Senn-Smith Company, manufacturers of mining equipment, and in 1917 he was made district manager of the Lakewood Engineering Company, later being appointed eastern sales manager. In 1924, he was engaged in special engineering investigations and in the following year was appointed manager of the railroad equipment department of the Parsons Company, Newton, Iowa, which position he was holding at the time of his recent appointment as manager of railroad sales for the Northwest Engineering Company as noted in the October issue.

William S. Miller

W. W. Coleman, president of the Bucyrus Company, has been elected president and chairman of the board of the Bucyrus-Erie Company, which has been formed as a consolidation of the Bucyrus Company and the Erie Steam Shovel Company, and which will become effective January 1. **E. K. Swigart,** vice-president of the Bucyrus Company, has been elected senior vice-president, and **F. B. McBrier,** president of the Erie Steam Shovel Company, **A. C. Vicary,** vice-president of the Erie Company, **D. P. Eells,** second vice-president of the Bucyrus Company and **W. M. Bager,** second vice-president of the Bucyrus Company, have been elected vice-presidents of the new company. **G. A. Morrison,** second vice-president of the Bucyrus Company, has been elected vice-president and treasurer of the new company, while **J. G. Miller,** assistant secretary of the Bucyrus Company, has been elected secretary.

A. D. Carriger, sales manager of the pump and tank division of the Wayne Company, Ft. Wayne, Ind., has been promoted to vice-president and director of sales for all plant divisions. **W. L. Kennedy,** assistant to the sales manager has been promoted to succeed Mr. Carriger.

Russell Wallace, vice-president of Crerar, Adams & Co., Chicago, has been elected president to succeed E. F. Shepard, deceased. Mr. Wallace was born on January 23, 1864, at Beachville, Ont., and entered railway service in 1880 as a clerk in the store department of the Michigan Central at West Detroit, Mich. In 1881 he was transferred to the office of the purchasing agent and in 1888 was appointed purchasing agent of the Duluth, South Shore and Atlantic. In 1890 he was appointed purchasing agent of the Chicago & West Michigan, the Detroit, Lansing & Northern and the Saginaw Valley & St. Louis (now parts of the Pere Marquette). On January 1, 1900, he was made purchasing agent of the Grand Rapids division of the Pere Marquette, resigning in March of the same year to become associated with Crerar, Adams & Co., where he served successively as assistant to the vice-president, general sales manager, and secretary. He was promoted to vice-president in 1914, which position he was holding at the time of recent election as president.

Russell Wallace

Trade Publications

1-4 Concrete Inserts.—The Midwest Steel & Supply Company, Bradford, Pa., has issued a folder illustrating and describing its 1-4 concrete inserts, designed for use in reinforced concrete building construction to afford a firm fixture in walls, columns and ceilings, to which shelf angles, or the many and various types of hangers, may be affixed with adjustability.

The Parsons Crane—The Fairmont Railway Motors, Inc., Fairmont, Minn., sales representatives for the Parsons Crane, manufactured by the Parsons Company, Newton, Iowa, has issued a leaflet describing the mechanical and safety features of this crane, which is adapted not only to laying rails but also to handling ties, timber, coal, ballast and scrap and also to furnishing power for the operation of pneumatic or electric tools.

Sullivan Water Hammer Drill.—Bulletin No. 81-M, issued by the Sullivan Machinery Company, Chicago, describes the new T-3 mounted water hammer drill which has been designed and placed on the market by that company for use in either hard or soft rock. A full description of the machine is given, supplemented by illustrations on different kinds of work. Tables are also presented showing the dimensions of the machine and its accessories.

The Track Machine aiding in yard construction of the Norfolk & Western Railroad at Portsmouth, Ohio. Here the track is being moved over to the edge of the plowed shoulder.

Every Railroad Needs This New Machine

Wherever a track gang is maintained for shifting or raising track, doing a ballasting job, or re-laying steel, here is a piece of equipment that saves time and money. On the job shown above, the owner of the machine had this to say for it:

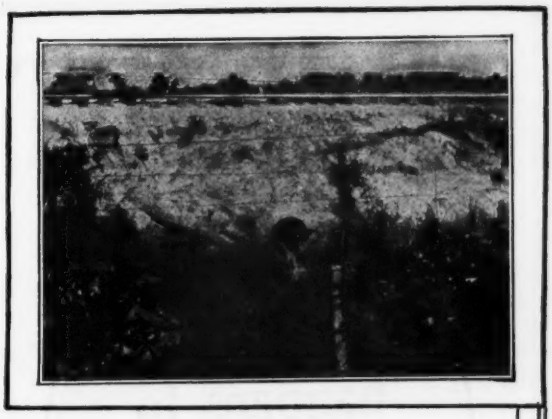
> "Shifting track by the old method is very expensive. We find that your machine will shift at an expense of $25.00 per day, including sufficient men to surface and re-align track, as much as thirty-five men can do by hand. It goes without saying that we are more than pleased with our purchase."

Similar reports received from users invariably report big savings. In addition to a job of this kind, by applying extra attachments, it can also be used for raising and ballasting jobs and handling steel. It is not a one purpose machine. Here is a piece of equipment that can be used on all your track jobs. Keep it busy and it will bring a greater return than any other machine you are now using.

Write Track Machine Department for further information of what the Track Machine is accomplishing for its users. Bulletin YE-8 describes it.

Nordberg Mfg. Co., Milwaukee, Wis., U. S. A.

THE NORDBERG PATENTED TRACK MACHINE



Traffic Proof!

The ability to withstand tremendous pressure from overhead fills—a strength that is unimpaired by years of service under heavy vibration. These statements regarding Spi-Cor Culverts are not just claims, but proven facts, supported by the numerous records in our files.

The story of Spi-Cor resistance to rust, wear and depreciation under extreme conditions of climate, soil and traffic should be in your hands. Railroad Bulletin No. 72 carries the facts that point the way to economy for your road. Sent on request—gladly.

AMERICAN CASTING CO.

Culvert Pipe Headquarters

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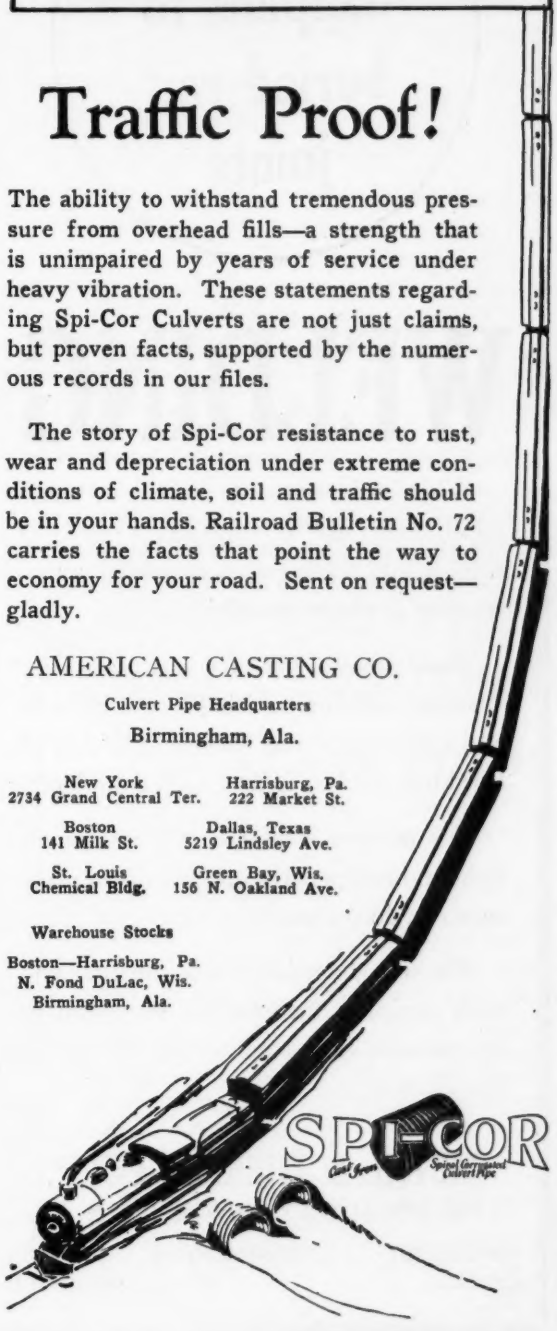
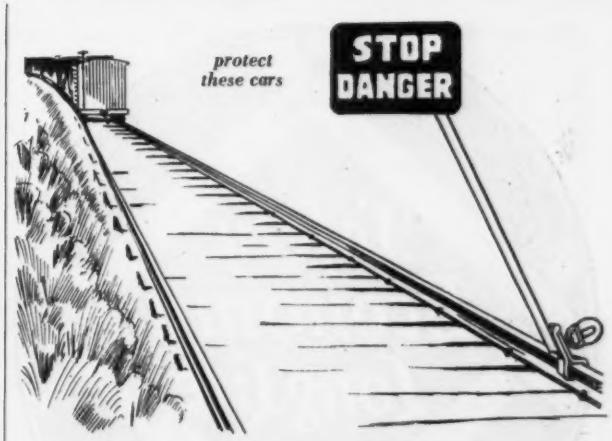
Boston, 141 Milk St. — Dallas, Texas, 5219 Lindsley Ave.

St. Louis, Chemical Bldg. — Green Bay, Wis., 156 N. Oakland Ave.

Warehouse Stocks

Boston—Harrisburg, Pa.
N. Fond DuLac, Wis.
Birmingham, Ala.





Safety Always—

with L. F. & S.

(PATENTED)

BLUE SAFETY FLAGS

We are all working for a 35% reduction in accidents by 1930

These Blue Safety Flags will help you to accomplish this on your railroad. Do not delay in placing your order for these. Ask for circular.

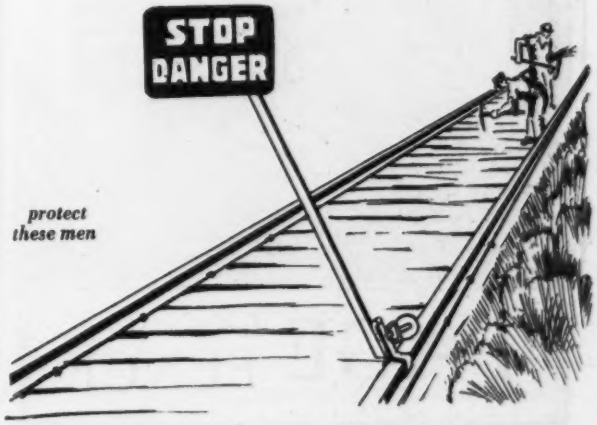
They lock to the rail and cannot be removed except by man having key.

No Accidents Today—

The Cheeriest Report of All

Louisville Frog & Switch Co.

Louisville, Kentucky



Classified Advertisements

Use this section when seeking a new man, a new position, or when buying or selling second-hand equipment.

CLASSIFIED ADVERTISEMENTS, $10.00 an inch, one inch deep by three inches wide an insertion.

EMPLOYMENT ADVERTISEMENTS, 10 cents a word a month, minimum charge $2.00. Remittance must accompany each order.

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Anti-Creepers, Rail
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Lehon Co.

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Industrial Brownhoist Corp.

Ballast Screens
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Ballast Spreaders
Jordan Co., O. F.
Western Wheeled Scraper Co.

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Bank Slopers
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Ballast Trimmers
Jordan Co., O. F.

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American Saw Mill Machy. Co.

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Carnegie Steel Co.
Illinois Steel Company

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Buda Company
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Kalamazoo Railway Supply Co.
Mudge & Company
Northwestern Motor Co.
Woolery Machine Co.

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Industrial Brownhoist Corp.
Owen Bucket Co.

Buckets, Clam Shell
Hayward Co.
Industrial Brownhoist Corp.
Owen Bucket Co.

Buckets, Drag Scrape; Orange Peel; Electric Motor
Hayward Co.

Buckets, Tote
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Massey Concrete Prod. Corp.

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Car Replacers
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Magor Car Corp.
Western Wheeled Scraper Co.

Cars, Inspection
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Kalamazoo Railway Supply Co.
Mudge & Co.
Northwestern Motor Co.
Woolery Machine Co.

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Fairmont Ry. Motors, Inc.
Kalamazoo Ry. Supply Co.
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Northwestern Motor Co.
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Maintenance Equipment Co.

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Kalamazoo Railway Supply Co.
Mudge & Co.
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Corrugated Iron
Armco Culvert & Flume Mfrs. Ass'n.

Counterweight Drums
Hayward Co.

Cranes, Barge, Electric Erecting, Gantry, Locomotive, Pillar, Transfer, Tunnel, Wharf and Wrecking
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Interstate Car & Foundry Co.

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Carey Co., Philip
Headley Good Roads Co.

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Buda Co.
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Louisville Frog & Switch Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.

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Western Wheeled Scraper Co.

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American Cast Iron Pipe Co.
American Casting Co.
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Ingersoll-Rand Co.

Dieing Machines
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Drills, Pneumatic
Ingersoll-Rand Co.

Drills, Rock
Ingersoll-Rand Co.
Sullivan Machinery Co.
Verona Tool Works

Drill Steel, Rock
Ingersoll-Rand Co.
Sullivan Machinery Co.

Drills, Track
Buda Co.
Ingersoll-Rand Co.
Kalamazoo Railway Supply Co.
Railroad Accessories Corp.

Drinking Fountains
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Dump Cars
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Jordan Co., O. F.
Koppel Industrial Car & Equipment Co.
Magor Car Corp.
Western Wheeled Scraper Co.

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K. & W. Equipment Co.
Northwestern Motor Co.
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Electric Snow Melters
Lundie Engineering Corp.
Q & C Co.

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Northwestern Motor Co.
Woolery Machine Co.

Engines, Motor Car
Buda Co.
Fairmont Railway Motor Co.
Kalamazoo Railway Supply Co.
Mudge & Co.
Northwestern Motor Co.
Woolery Machine Co.

Engines, Oil
Buda Co.
Fairmont Railway Motors, Inc.
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Cyclone Fence Co.
Page Fence Association
Q & C Co.

Fence, Fabric
American Steel & Wire Co.
Cyclone Fence Co.
Page Fence Association

Fence Posts
Massey Concrete Products Corp.
Page Fence Association
Q & C Co.
Sweet's Steel Co.

Fibre Angle Pieces, Bushings, Plates, End Plates, etc.
Q & C Co.

Fibre Insulation
Q & C Co.

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Q & C Co.

Flangeway Guards
Lebanon Steel Foundry

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Barber Asphalt Co.
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Track Specialties Co.
Wharton Jr. & Co., Inc., Wm.

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Gages, Pressure Gas
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Gas, Acetylene
Oxweld Railroad Service Co.

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Ingersoll-Rand Co.
Sullivan Machinery Co.

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Johns-Manville Corp.
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Buda Co.
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Metal & Thermit Corp.
Q & C Co.
Rail Joint Co.
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Joint Fastenings
Illinois Steel Co.

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Carnegie Steel Co.
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Metal & Thermit Corp.
Q & C Co.
Rail Joint Co.
Track Specialties Co.
Wharton Jr. & Co., Wm.

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Q & C Co.
Rail Joint Co.
Track Specialties Co.

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Massey Concrete Products Corp.

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Paint, Metal Protecting
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Q & C Co.
Track Specialties Co.

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Rails, Tee
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